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Vol. XLII, No. 1 **Concrete** January, 1934

# Secondary Roads Draw Attention of Concrete Construction Industry

### Cement-Bound Macadam and Single-Track Concrete Slabs Provide Low-Cost Systems—Elmhurst Experimental Road to Supply Engineering Data—A Highway Designers' Manual

CONTRACTS awarded during the first eleven months of 1933 for construction of concrete roads, streets and alleys, amounted to 39,210,000 sq. yd. It is probable that when figures on December contracts are in, the total for the full year will be around 45,000,000 sq. yd., equivalent to about 4,260 miles of 18-ft. concrete pavement. This compares with a total of 96,827,477 sq. yd. in the full year of 1932 and 134,488,823 sq. yd. in 1931.

## Improved Prospects for 1934

The contracts awarded in 1933, therefore, have fallen short of previous years; but there is cause for encouragement in the fact that the PWA highway construction program has started to take hold. Because of the large carry-over of late 1933 contracts into 1934, that source alone should lead to a greater volume of actual construction of concrete highways in 1934 than in 1933. When undiverted gasoline tax funds are added to the 1934 PWA program, the total of highway construction money available in the coming year should exceed that of the year just closed.

## Secondary Roads an Important Factor

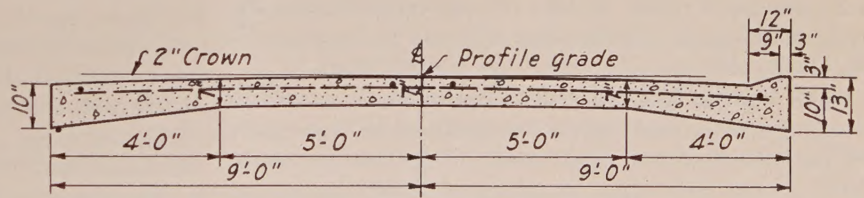
An important development in 1933 was the emphasis placed on the construction of secondary highway systems. A great stimulus in this direction came from the PWA program itself, in which secondary roads are an important element. Aside from this, many state highway departments had begun to give greater attention to their secondary systems, more especially in states where the primary systems are well advanced.

An unfortunate trend in connection with secondary road construction is seen in the tendency to construct them of inferior types. Much has been accomplished toward the development of sounder thinking in this direction, but much remains to be done.

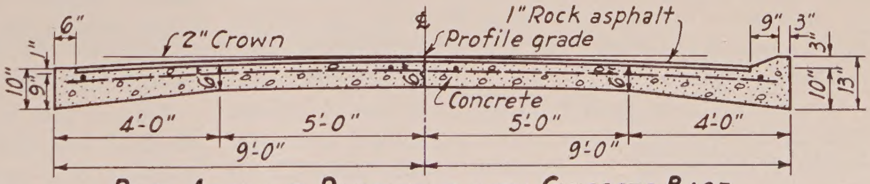
## A Notable Experimental Road

The greater use of concrete slabs and cement-bound macadam in secondary road construction should result from the development work undertaken by the Portland Cement Association. Notable among these activities was the construction of an experimental road of cement-bound macadam at Elmhurst, Illinois, in the summer of 1933, described briefly on page 9 of the July issue of CONCRETE.

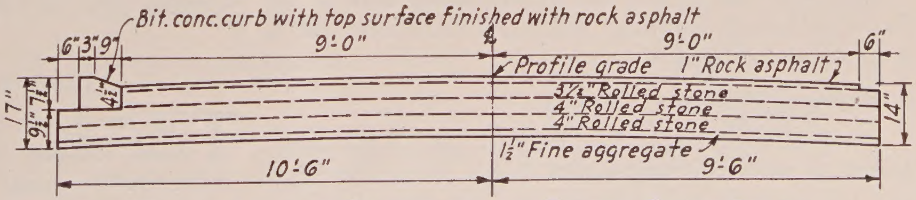
The Elmhurst experimental road was built in 60 sections, to a total length of 1,200 ft., various materials and material sizes, and varying consistencies of grout, having been used in the different sections. The purpose, of course, is that of developing authentic data for the use of highway engineers who wish to obtain the greatest possible



REINFORCED CONCRETE PAVEMENT
without curb · with curb



ROCK ASPHALT PAVEMENT WITH CONCRETE BASE
without curb · with curb



ROCK ASPHALT PAVEMENT WITH ROLLED STONE BASE
with curb · without curb

**Alternate bids taken by Iowa State Highway Commission disclosed contract price for reinforced concrete pavement far below other two types**

measure of efficiency combined with economy, in the development of their secondary highway systems.

### Specifications for Cement-Bound Macadam

Another useful contribution to information on cement-bound macadam is in the form of a recommended specification for this type, developed by the Portland Cement Association on the basis of information gained from the Elmhurst experimental road. Copies of the specification may be obtained on request from that association. This new specification differs to some extent from the one printed in full in the May (1933) issue of CONCRETE, pages 9 and 10. Methods of constructing cement-bound macadam pavements were described in several articles appearing in CONCRETE throughout the year.

### Single-Track Concrete for Secondary Roads

Single-track concrete slab roads as an economical low-cost type for secondary highways also received much attention during the year, both from the American Road Builders' Association and the Portland Cement Association. Figures disclosed by the Gustafson committee of the A. R. B. A. and contained in an article on pages 8 and 9 of the July (1933) issue of CONCRETE show that the original cost of this type of secondary road is virtually the same as that of less durable types. When considered over even a short period of years, the small maintenance cost of the concrete road as compared with the less durable types places the concrete and the cement-bound macadam slabs into a class by themselves as the most economical of all.

### Low Cost of Concrete Slabs

In this matter of first cost, the development of cost-reducing methods and equipment in concrete road construction has brought contract prices for concrete slabs to a point where bids submitted are well below the figures for comparable types. In fact, the cost range for concrete slabs or cement-bound macadam will now be found to rub shoulders with prices for much less durable types.

What has just been asserted in regard to costs was well demonstrated in Iowa, where competitive bids were taken by the State Highway Commission in the late summer of 1933 on the three types of pavement shown in the line illustration, for a project 10 miles long. The contract award went to reinforced concrete, at $1.84 per sq. yd., including the cost of cement, which is to be furnished by the contractor. Alternate bids were $3.10 per sq. yd. for rock asphalt on a concrete base, and $3.30 for rock asphalt on a rolled stone base.

Many other developments during 1933 are of interest to the field of highway construction, as disclosed in articles printed in CONCRETE. Considerable further investigation was made in the direction of utilizing high-frequency vibration in placing concrete in pavements, and in the matter of delayed finishing. Watertight joints were also a subject under investigation.

### A Highway Designers' Manual

A step of outstanding importance is seen in the development of means for the rational design of concrete highway and street pavements so that the slab sections will be in line with the loads to be carried.

This very practical aid to designers of concrete road and pavement slabs is available in the form of a 60-page manual for highway engineers, by Frank T. Sheets, for many years chief engineer for the Illinois Division of Highways and now consulting engineer for the Portland Cement Association. The manual, published by the Portland Cement Association in November, 1933, under the title of "Concrete Road Design," was briefly reviewed on page 19 of the December issue of CONCRETE. Copies are available to highway engineers on request addressed to the Portland Cement Association.

### Scope and Purpose of Designers' Manual

Space will not permit the printing of even a condensed outline of this valuable contribution to literature on highway engineering; but at least the scope and purpose of the manual may be understood from the following quotations from the author's introductory comments.

"During the past twelve years," the author states, "great advances have been made in the science of designing concrete pavements. Test roads, scientific researches, field investigations and mathematical analyses have combined to remove in large measure the necessity for guess-work in design. However, the reports of such researches, investigations and studies are so numerous, so scattered, and in some cases so complex, that the average busy engineer has difficulty in assembling and assimilating what he needs, and in reducing the material to workable form.

"This manual is dedicated to this evident need of the practicing engineer. The results of research and mathematical analysis are reduced to the lowest terms of simplicity and workability. No effort has been made to be profound; no theorizing is indulged in; no unproved engineering principles are advanced; and the only claim to originality is the employment of an orderly sequence of established engineering principles which permits the most economical design of pavements to meet rationally-predicted traffic conditions.

"Stated specifically, the proposed method of design contemplates (1) that the road be adjusted to the loads; (2) that pavements be designed for the predominating wheel loads with a safety factor of two; and (3) that the fatigue behavior of the pavement slab under the heavier loads be evaluated as a basis for determining life expectancy."

The author explains, further, that the soundness of the design method proposed is fully proved by its complete agreement with the behavior of the test sections on the Bates (Illinois) experimental road, tested under actual traffic many years ago.

### 1933 Not a Barren Year

Thus it will be seen that, while concrete highway construction was at a low ebb in 1933, some important developments were under way—and several of these developments are of exceptional importance because of their far-reaching effect on future yardage.

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## Housing Bulletin Issued

THE December (1933) issue of *Engineering Experiment Stations News*, published by Ohio State University, is a special housing number of 16 pages containing much data of interest to planners of housing programs.

Copies can be obtained by addressing Engineering Experiment Station, Ohio State University, Columbus, Ohio.

# Rigid Concrete Bridge Feature of Highway-Railway Separation

### Supports Canadian National's Main Line Traffic on Span of 72 Ft.—Concrete Tests 3,600 Lb. at 7 Days—Continuous Inspection Maintained

A RIGID-FRAME reinforced concrete bridge, having a clear span of 72 ft. 6¼ in. and designed for heavy double-track railway loading, now carries the main line of the Canadian National Railways across a concrete highway at Vaudreuil, a short distance west of Montreal. The span of 72 ft. 6¼ in. is the dimension parallel to the tracks. The bridge is on a skew and both the highway underneath and the railway have curvature at the crossing. The tangents to the curves of the highway and the railway at the center of the bridge form an acute angle of 57 deg. 30 min. The railway tracks are on a 30-min. curve. The span at right angles to the end legs or abutments is 61 ft. 2 in.

## A Modern Development

This structure, opened to traffic in November, is not only about the last word in grade separation structures, but it represents a distinctly modern development in railway design and construction. In spite of being on the double-track main line of this great railway system, the bridge is believed to have a greater clear span than any other rigid-frame structure designed and built for heavy railway loading. And again, in spite of the long span, this rigid-frame design proved to be extremely economical in cost of construction.

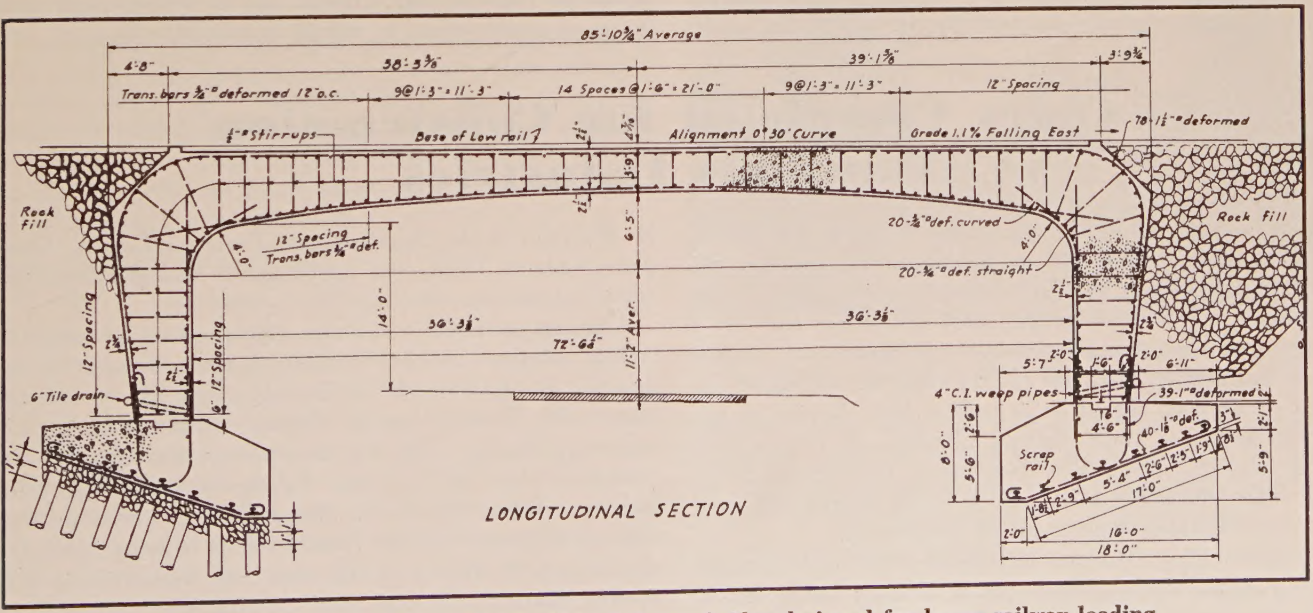
From the engineering standpoint this type of design represents the greatest possible efficiency of materials, inasmuch as the entire structure, particularly that part above the footings, is utilized in the resistance of bending stresses.

Another important feature is the omission of track ties. The track is carried on concrete cast in place after the bridge proper was completed. This concrete track base has a transverse slope determined by the superelevation required, the thickness of the base being 7¾ in. at the high side and about 4 in. on the low side. This scheme, of course, solved at once the difficulty of giving superelevation to the rails and placement of tracks to exact curve and surface. The rails rest directly on the concrete, with only a 5½-in. oak strip ranging from 1⅛ to 1⅞ in. in thickness intervening to provide a cushioning effect. The rail clips are held by means of bolts embedded in the concrete and fitted with both metal and fiber washers—the latter serving as cushions.

The method of reinforcement is clearly illustrated in the longitudinal section shown in the line drawing. An interesting detail, seen at the left end of the drawing, is the manner in which the pile heads are prevented from coming into contact with the footing, by means of a rock fill. This detail of construction leaves the footing free to act in conjunction with the superstructure. The footings, it will be observed, are made monolithic with the superstructure, because of the manner in which the footing reinforcement is bent up and extends through the construction joints.

## Placing Procedure

Since it was necessary to keep the railway traffic moving, the bridge was built in halves, divided longitudinally, after the footings had been completed. While the first half was hardening to the point where traffic could be diverted over it, the four wings were concreted. When



Longitudinal section shows details of rigid-frame bridge designed for heavy railway loading tests indicated that the concrete in the first half had attained a strength in excess of 3,000 lb. per sq. in., railway traffic was passed over it, although all forms and centering were left in place until the entire project was completed.

Each half of the superstructure was concreted in a continuous run of 24 hours, the contractor having employed two ½-yd. mixers. The joint between the two sections of the bridge as built is made tight by the use of a 6-in. by ⅛-in. sheet lead, embedded in the concrete on each side of the joint, and shaped to form a "V" in the joint. Favorable weather conditions prevailed throughout the concreting operations.

**The bridge was built in halves, divided longitudinally, while railway traffic was kept moving**

### High-Frequency Vibration Employed

Two high-frequency vibrators of French manufacture were used in placing the concrete, which had an average slump of 3 in. These vibrators were found to be very effective in settling the freshly placed concrete into all corners of the forms and around the heavy reinforcement, and in attaining the greater density than would have been possible by hand puddling. Care was taken in the use of the vibrators, so as to avoid excessive vibration and possible segregation of coarse aggregates. Hand spading was also employed, supplementing the vibration.

### Design and Strength Requirements

The bridge was designed for Cooper's E-60 loading, with allowable unit stresses of 1,200 lb. per sq. in. in the concrete in flexure, and 18,000 lb. tensile stress in the reinforcing steel, which was specified as either rail steel or high-carbon billet steel. Specifications called for concrete testing 3,000 lb. or better at the age of 7 days. Field tests indicated 7-day strengths averaging around 3,600 per sq. in.

The quantities of concrete were 176 cu. yd. in the footings and 567 cu. yd. in the rigid-frame superstructure. Reinforcement used in the design included 12,900 lb. of bars and 480 lin. ft. of old rails in the footings, and 96,114 lb. of bars in the superstructure. From this it will be seen that the rigid-frame superstructure utilized an average of 170 lb. of reinforcement per cubic yard of concrete.

### Maintain Continuous Inspection

Because of the importance of obtaining absolute compliance with quality requirements in a structure of this type, competent and continuous inspection was maintained throughout the concreting operations, and careful watch was kept on the quality of the aggregates delivered by the contractor.

A highly-trained and competent inspector representing the railway company was on the job continuously. He checked up on the proportions of materials, he attended personally to the making of test cylinders and shipped them daily to the Canadian Inspection Company. He made daily reports to the bridge engineer, and to the engineer of construction of the railway company, on report blanks devised for this character of work.

In addition, the chief chemist of the Canadian Inspection Company was in close touch with the actual construction work and was given complete charge of concreting operations. He issued all instructions regarding proportions of materials, and he made tests of aggregates at their source and at the job, including freezing and thawing tests of the course aggregate.

### Acknowledgment

The design and construction of this interesting grade-separation structure was under the jurisdiction of C. P. Disney, bridge engineer, and R. A. Baldwin, engineer of construction, of the Canadian National Railways, with offices in Toronto. Mr. Disney was in active touch with the work at all stages of design and construction.

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# Codes Completed for Construction Materials Industries

As announced in the December issue of CONCRETE, President Roosevelt on November 27 signed codes of fair competition for the portland cement, the concrete masonry and the reinforcing steel industries, and for a large group representing various producers of concrete floor treatments. The code for the concrete aggregates industry had been signed at an earlier date. Copies of any of the approved codes may be obtained at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from district offices of the United States Department of Commerce.

*Concrete Pipe.* The code for the concrete pipe manufacturing industry was given a public hearing on November 28, and is expected to be signed at an early date. George E. Warren, of the Southwestern Portland Cement Company, Osborn, Ohio, was appointed as industrial adviser for this industry.

*Members of Code Authority.* Appointment of administration members of code authorities for a number of industries was announced on December 13. These include Barton W. Murray for the cement manufacturing code authority; Ralph Fogg for the concrete masonry and the lime industries; B. R. Value for the concrete aggregates industry; Frank Upman for the reinforcing steel industry; Russell M. Searle for the concrete floor treating industry; and George S. Brady for the two code authorities representing manufacturers of rock crushing and road machinery.

# Ohio's Winter Concrete Paving Work Points Way to Other States

## How Materials Were Heated and Concrete Kept Warm—High-Early-Strength Cement Requires Short Curing Period—Procedure for Winter Paving Work

IN former years contracts for highway construction were awarded during the winter, spring and early summer. Construction, particularly paving, increased in volume from early summer until late fall, when it reached a maximum. With the coming of cold weather, highway construction stopped—men employed in road building were thrown out of work until the season opened the following year.

Federal funds for road construction in 1933 were not made available until after the middle of the year. Contract awards were approaching a maximum rate on December 1, construction work just getting under way. The need for employment is greater than at any previous time in history. Highway construction must go forward during the present winter if PWA is to provide the employment for which it was designed.

### Ohio Places Concrete Pavements in Winter

Despite the deeply embedded habit which causes road work to cease in northern climates with the coming of winter, highway construction can furnish a substantial volume of employment during the winter months. Many states have wisely adopted programs during the present winter which provide for uninterrupted operations, including paving, and on bridge and culvert building. Excavation and the erection of structures are operations which are readily carried on in the presence of low temperatures. Paving has been looked upon as work which must stop when cold weather comes. This is no longer necessary. On dozens of jobs, resourceful construction men have proved that with modern materials, proper plant, planning and organization, winter paving work is not only feasible but is economically sound.

To illustrate the possibilities of concrete paving as a winter job-producing agency, consider the results obtained on Ohio Federal Aid Project No. D539C during the winter months of 1932-1933. More than 700 men found employment as a result of this project. These men were not on the Hamilton County home relief rolls, but on the payroll of a going construction job.

### How Concrete Was Heated

Excavation, relocation of substructures and paving went forward except in stormy weather. Concrete aggregates were batched at a plant 3½ miles from the job. Steam coils in the aggregate bins raised temperatures to proper levels as determined by results at the mixer. Trucks were provided with batch partitions and with canvas tarpaulins to protect the cement and to conserve the heat. A steam boiler mounted on a sled was placed immediately in the rear of, and cabled to, the mixer, moving forward with the latter as paving operations progressed. This boiler heated the mixing water to temperatures required by weather conditions, so that concrete was discharged at a satisfactory temperature. The average temperature of concrete as laid on the subgrade ranged from 60 to 65 deg. F., but at times it reached as high as 75 deg.

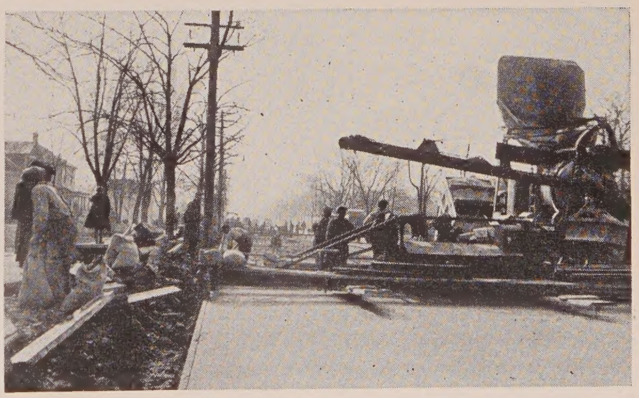
### Keeping the Concrete Warm

To minimize morning concreting delays, the prepared subgrade for a reasonable distance ahead of the completed pavement was protected each night with a heavy covering of straw. The following morning gasoline was sprinkled on the straw and then burned, removing any light frost which might have existed.

To retain heat in the newly placed concrete, the pavement was covered with burlap and straw as soon as possible after finishing. An effort was made to finish the pavement promptly so that the protective straw covering could be applied in a minimum amount of time, thereby conserving heat. It is interesting to note that concrete, placed at a temperature of 60 deg. F. in an atmospheric temperature of 35 deg., retained its placing temperature the following morning even though the air temperature during the night had dropped to 20 deg. or less.

### Why High-Early-Strength Cement Was Used

In order to make possible prompt finishing, minimum curing and early opening to traffic as well as to minimize the hazard of frost damage, a high-early-strength portland cement was used on this project. Because all this pavement was laid in the presence of atmospheric temperatures which had heretofore forbidden concrete slab operations, the contractor worked longer hours and therefore proceeded at a more rapid rate than would have been possible if high-early-strength cement had not been used. In fact, two shifts of five hours each per day were employed because of the labor restriction of 30 hours per week.



**Ohio's winter concrete paving projects point way to other states. Placing concrete in Wyoming, O., in January, 1933**

### Cost Figures Show Economy

Construction costs on this project indicate that there is slight difference between the cost of building in winter months, using high-early-strength cement, and the cost of paving laid in the usual manner, using ordinary portland cement. This difference is more than made up by gains to society through the elimination of men from the relief rolls. While not evaluated in dollars and cents, this gain should be considered in connection with any statement of cost.

The following figures are cost estimates for the Wyoming, Ohio, project:

| | High-Early-Strength Cement | Ordinary Cement |
|---|---|---|
| **F. O. B. cars, Cincinnati, Ohio, per bbl.** | **$2.02** | **$1.52** |
| Cost of unloading, per bbl. | .04 | .04 |
| Cost of hauling, per bbl. | .01 | .01 |
| Storage and material loss, per bbl. | .05 | .05 |
| COST OF CEMENT AT MIXER, per bbl. | $2.12 | $1.62 |
| Cement cost at 1.575 bbls. per cu. yd. of concrete | $3.34 | $2.55 |
| Sand cost at 52c per ton at mixer | .66 | .66 |
| Gravel cost at 80c per ton at mixer | 1.00 | 1.00 |
| TOTAL COST OF MATERIALS PER CU. YD. OF CONCRETE | $5.00 | $4.21 |
| Plant cost, road cost, forms, fine gr., placing and finishing, per cu. yd. | .84 | .84 |
| Curing and maintaining traffic | .04 | .20 |
| TOTAL COST PER CU. YD. OF CONCRETE PAVEMENT PLACED | $5.88 | $5.25 |
| Profit and overhead per cu. yd. concrete | .48 | .48 |
| Cost of steel, joints, etc., per cu. yd. | .36 | .36 |
| TOTAL COST PER CU. YD. OF CONCRETE | $6.72 | $6.09 |
| Contractor's bid per sq. yd., 9-in. pavement | $1.68 | $1.52 |

It is interesting to note that the cost item for curing and maintaining traffic was only 4 cents per cu. yd. or 1 cent per sq. yd. when high-early-strength cement was used, and 20 cents per cu. yd. or 5 cents per sq. yd. when ordinary portland cement was used.

### Extremely High Strengths Attained

The Ohio State Department of Highways conducted a large number of concrete strength tests in connection with this project upon pre-molded 6 by 12-in. cylinders, 6 by 6 by 42-in. beams and upon cores cut from the pavement itself. The results of these tests may be summarized as follows:

| Age | Ultimate Strength in Lb. per Sq. In. | | |
|---|---|---|---|
| Days | Cylinders | Cores | Beams |
| 1 | — | 1,716 | 235 |
| 2 | 3,576 | 2,858 | 384 |
| 3 | 3,677 | 3,760 | 534 |
| 4 | 4,916 | — | — |
| 7 | — | 4,630 | 750 |

In his paper read before the Ohio Engineering Society, Robert C. Fisher, assistant division engineer, State Department of Highways, mentioned this project and stated: "In enumerating the purposes for which high-early-strength cement was selected, the most noticeable results were: (1) reduction of the curing period, (2) elimination of detours at intersections, (3) opening the pavement for traffic at a much earlier date, (4) permitting property owners to use driveways in a shorter period, (5) lessening the inconvenience to traffic and population served, and (6) enabling the highway department to carry out an emergency construction program, whereby employment was given to many of the unemployed in Hamilton County during the fall and winter months."

### Ohio's Example May Be Followed Everywhere

The experience at Wyoming, Ohio, is possible of duplication on hundreds of jobs throughout the country at this time. Men can be put to work and kept at work if the methods there successfully employed are adopted. By this means hundreds of thousands of dollars can be put into payrolls during the winter months that otherwise would be spent on bread-line relief.

The requirements of a successful winter paving job, barring extreme weather, are—

(1) A uniform subgrade (straw covering and care in handling final excavation will minimize frost penetration).

(2) Heated aggregates (simple apparatus will cheaply raise the temperature of sand and stone to 80 or 90 deg. F.).

(3) Heated water (a low-pressure boiler hooked to the mixer feed pipe line and mounted on skids will supply water at 120 to 140 deg. F. at slight cost).

(4) High-early-strength portland cement (produced by more than 25 manufacturers and available east of the Rockies at a price 50 cents per barrel more than that of ordinary portland cement).

(5) Adequate covering of straw and canvas for the placed concrete (if efficient covering be promptly applied, artificial heat in the concrete plus that developed by the cement during hydration, will largely offset heat loss except in extremely cold, windy weather).

### How Winter Paving May Be Increased

With requirements as simple and economical as the foregoing indicate, paving operations may be expanded so as to increase greatly the volume of highway construction which can be prosecuted during winter months over a large section of the country. Such an expansion would greatly increase the wage-producing capacity of the highway construction industry.

The form which such a winter program might take is as follows:

(1) During November and December in the extreme northern territory daily paving production can be greatly increased and in many cases doubled. Critical paving sections can be completed before the winter shut-down. Additional wages thus produced will enable many families to get through the winter without becoming dependent upon local relief.

(2) Just south of the snow belt, barring excessive precipitation, the more important projects can be built *straight through the winter*. With heavy excavation work and the erection of bridges and minor drainage structures going forward on all projects and paving operations on major road projects, highway construction will furnish a surprising volume of employment at a time when its beneficial effect is most needed.

(3) In the zone of moderate winters, all work can go forward during the entire winter. The closing down of road jobs during the winter months in those states lying between the North and the South is more a matter of habit than necessity.

Several state highway departments have taken a progressive stand in letting jobs for winter construction. In some of these states proposal forms include separate items for all classes of concrete placed in summer or in winter, thereby enabling the contractor to reflect in his bid the cost of heating, curing and special materials.

## The Euclid Housing Plan Available

An unusual amount of interest has been shown in the talk by Mayor Charles R. Ely, of Euclid, Ohio, given before the Chicago housing conference on November 1, and mentioned on page 11 of the December issue of CONCRETE.

In response to this interest the National Association for Better Housing has multigraphed Mayor Ely's paper, which describes in considerable detail the housing plan adopted at Euclid and approved for Government financing.

Copies of Mayor Ely's paper may be obtained by addressing Henry A. Guthrie, secretary of the National Association for Better Housing, 59 East Van Buren St., Chicago, Illinois.

# Cement-Bound Macadam Brings New Thought on Secondary Roads

## Specifications and Methods Developed—Engineering Data Supplied from P. C. A.'s Experimental Road Project—Single-Track Concrete Roads Also Found Economical

CEMENT-BOUND macadam has demonstrated its ability to resume a place as an important factor in the construction of roads and pavements.

Built quite extensively in a period of some 20 years ago, this form of road construction was all but forgotten after the advent of concrete slab roads. In 1932, new interest began to be centered on this type. Many of the old pavements built in some of the Eastern states, were found to be in excellent condition, despite the crude methods employed in their placing. Now, it was thought by many highway engineers, modern methods and modern equipment should produce a similar pavement of much higher quality.

Single-track concrete road under construction in Iroquois County, Illinois

### Interest Revived in 1932

It was thus that the latter half of 1932 saw the construction of a number of experimental roads of this type, ranging in length from a few hundred yards to 1 1/3 miles. The year 1933 saw a decided increase in the attention devoted to cement-bound macadam, especially in connection with the development of standardized construction methods and specifications. Furthermore, three Eastern states—New York, New Jersey and Pennsylvania—built a considerable yardage as a means of developing additional experience in the light of present knowledge.

### Three Projects in Union County, N. J.

Notable among the cement-bound macadam roads built in 1933 are three projects in New Jersey, at Westfield, Kenilworth and Roselle, all located in Union County and built as relief projects under the direct supervision of Herman Kling, county supervisor of roads, by means of funds taken from the state-aid allotment to the county.

The labor force on the three New Jersey projects just mentioned consisted of a nucleus of the regular forces of the county supervisor of roads, supplemented by relief labor. County-owned tools and equipment were used, except that a 5-ton steam roller and three transit-mixer trucks were employed on a rental basis.

One of the illustrations shows one of the New Jersey cement-bound macadam projects—at Kenilworth—under construction. This pavement, built in halves to a finished thickness of 7 in., may be considered typical. In the illustration the right half had been completed and was being used for the storage of materials and operation of equipment in placing the second half. The weight of the roller on the left is 5 tons.

### Experimental Road Supplies Engineering Data

The 1,200-ft. strip of experimental road built of cement-bound macadam construction last summer at Elmhurst, Illinois, by the Portland Cement Association, was described and illustrated on page 9 of the July (1933) issue of CONCRETE.[1] This same experimental project is mentioned in the leading article of this issue. It will, therefore, suffice to record here the character of the engineering data obtained from the 60 test sections comprising the Elmhurst road.

### Character of Information Obtained

Information thus far obtained indicates that crushed stone, coarse gravel (or pebbles), and crushed air-cooled blast furnace slag, all give satisfactory performance as coarse aggregate for the cement-bound macadam type of pavement. It was shown, in addition, that the range be-

Twentieth Street, Kenilworth, N. J., being paved with cement-bound macadam in June, 1933 tween the smaller and the larger sizes of coarse aggregate should not exceed 1½ in. That is, if the maximum size is 2½ in., the smallest size allowed in the material should be not less than 1 in.

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[1] Other articles on cement-bound macadam construction were printed in CONCRETE in the issues of November, 1932, p. 8; December, 1932, p. 15; January, 1933, pp. 5-6; May 1933, pp. 9-10; October, 1933, pp. 3-4 and p. 11; November, 1933, pp. 9-10.

Interesting data were also obtained with respect to the sand for the cement-sand grout. As regards both strength and penetration, the most satisfactory size of the graded sand was that ranging between the material retained on the No. 100 sieve and that passing the No. 8 sieve. Sand ranging in size from the No. 100 to the No. 4 sieve was used with complete success in test sections in which the coarse aggregate contained only large sizes; but in sections containing the smaller sizes of coarse aggregate this coarse sand could not be made sufficiently fluid without causing segregation of the materials in the grout.

Fine sand, ranging in size from the No. 14 to the No. 100 sieve, produced a more fluid grout than either of the coarser sizes, but required a greater amount of water, as a result of which the strength was reduced.

### High Strength Attained

The Elmhurst experimental road tests also disclosed the fact that losses of water due to absorption by the subgrade and by the coarse aggregate had the effect of reducing the water-cement ratio to about the ratio regarded as correct for mixed concrete. As a result, the strengths of test cores and beams were about what would have been expected from mixed concrete for pavement work.

Additional information obtained includes data providing accurate estimates of quantities of material required under the varying conditions prevailing in the test sections. Another matter of great importance was the development of a piece of equipment by means of which complete penetration of the coarse aggregate is insured.

Single-track concrete slab pavements also made very definite progress in 1933. The year saw the placing of nearly half a million square yards of this type of concrete pavement, mainly in Illinois and Missouri. In addition, an equal amount was placed in widening old single-track concrete roads in the two states named.

The second illustration shows the excellent workmanship in the placing of a single-track concrete road in Iroquois County, Illinois.

### An Economical Secondary Road Type

It will thus be seen that the single-track concrete road, a type that is economical in first cost and very low in cost of maintenance,[2] may become an extremely important factor in secondary road construction. Unquestionably this trend will be encouraged if such roads are designed in accordance with actual traffic requirements, as set forth in the highway designers' manual reviewed in the leading article in this issue, and on page 19 of the December issue of CONCRETE.

It is not going too far to predict that, in due time, highway engineers will in some cases find the single-track concrete slab the most economical type, and cement-bound macadam the most economical in other cases—but that these two types taken together will comprise the greater part of the yardage in secondary highway construction, just as heavier concrete slabs have long been used in the greater part of our primary highway mileage.

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[2] See article headed "Single-Track Concrete Roads Economical Low-Cost Type," in CONCRETE, July, 1933, pp. 8-9.

# Convention and Exhibit of Road Builders Starts Year's Important Events

PRESENT reports on prospective attendance indicate that the convention and exhibit to be held at the Stevens Hotel in Chicago during the week beginning January 22, by the American Road Builders' Association, will be the most important event of 1934 so far as the construction industry is concerned.

### Convention Program

Problems of the utmost importance to the industry will be discussed on the floor of the convention, indicated by the following scheduled list:

(1) Ways and means of continuing an adequate annual street and highway program.

(2) Gasoline taxes and motor license revenues for streets and highways only.

(3) The continuation of federal aid for highways.

(4) Highways and the public works program.

(5) Legislation.

(6) Building highways by contract.

(7) Maintenance.

(8) Codes that affect the highway industry.

Each of the foregoing subjects constitutes a major problem in the future welfare of the highway construction industry.

It is gratifying to know that the exhibit is to be held in the same building as the convention. Apparently the experience gained in Detroit last January—when the exhibit and the convention were miles apart—has had its good effect.

The Chicago exhibit is planned on a basis that avoids the huge expense involved in getting the heaviest machinery and equipment into place. It is believed that the method to be followed this year—that of exhibiting smaller machinery and making greater use of moving pictures and similar aids—will prove fully as instructive to visitors as if the gigantic exhibits of former years were repeated.

This exhibit, no less than former ones, will afford an opportunity to see the many advantages of the use of machinery in the economic and efficient construction and maintenance of streets and highways.

Visitors may inspect, and learn from first-hand knowledge, the advantages of material and equipment usage. Views on producer and consumer problems may be exchanged. Engineers and contractors may weigh the value of equipment and materials in one place and in a short time.

This convention and exhibit should have a far-reaching influence upon highway development throughout the nation during the coming year.

# ✦ EDITORIAL ✦

## *Concrete Highways Built in Winter*

GREATER and greater is the number of highway engineers who become convinced that highway construction work need not be allowed to slow down during the winter months.

Several articles in this issue supply very practical evidence that concrete road and street construction may be continued all winter, even in northern states.

Two general methods of procedure may be followed. Both methods require careful planning ahead, plus the application of well known practices in the placing of concrete during cold weather, plus the use of generous measures of common sense.

Given a certain highway construction project, whether located in the open country or in a densely populated metropolitan area, the first method calls for the completion of all grading, all filling, all drainage work, and all highway structures—bridges, viaducts, and grade separations—during the winter season. Then, in early spring, the concrete slab can be placed.

The second method is an extension of the first, from the fact that even the concrete pavement slab is placed during cold weather. This procedure is made possible through heating of the aggregates and mixing water, covering the concrete soon after it is placed, and, in some cases, using high-early-strength cement. The manner in which the state highway department of Ohio carries on such operations is told in detail in this issue of "Concrete."

Old ideas are constantly being trampled under foot through the advent of new ideas and methods. The old prejudice against building concrete highways in winter is doomed to a similar fate.

## *Secondary Roads Must Not Be Inferior*

SOME state and county highway departments who are attempting to stretch available funds over the greatest possible mileage are violating every principle of sound engineering by selecting inferior types of construction for their secondary highway systems.

Lower first cost is the lure that tempts them—and it also blinds them, for it can now be demonstrated that substantial types of pavement such as single-track concrete slabs, and cement-bound macadam slabs, can be built at a cost no greater than the cost of inferior types.

Those who may doubt the truth of this assertion are urged to refer to the 1933 report of the Gustafson committee of the American Road Builders' Association, abstracted in an article on pages 8 and 9 of the July (1933) issue of "Concrete."

The Gustafson report shows that the average cost of 139,000 square yards of 9-foot slab having a 9-6-9 cross-section, built in Illinois in 1932, was $7,640 per mile, or $1.44 per square yard. Figures from other sections tell similar stories. Maintenance costs on these roads are running less than $50 per mile per year.

Just how can any highway engineer justify spending the same amount of public money on types that will require higher maintenance expenditures, have less satisfactory riding qualities, and a considerably shorter life Or, how can he justify the expenditure of less money on still "cheaper" types on which annual maintenance charges may range from $1,000 to $1,500 per mile? Roads of this latter type are expensive at any price, no matter how low that alluring "first cost" may be.

In theory, engineers are supposed to be men who give their employers or clients the greatest possible value for the money expended. Highway departments who select inferior types of construction for their secondary highway systems are falling far short of this standard.

After all, a secondary road, no less than a primary road, should be designed for long life and adequate performance.

## *Construction Outlook More Favorable for 1934*

MEN in the construction industry are well aware that forecasts of construction activity in 1934 can be no more than an intelligent guess.

In spite of this mental reservation, construction people will find distinct encouragement in a special report on the building outlook for 1934, issued by the Brookmire Economic Service.

"One statement that may be made with certainty," says the report, "is that engineering construction in 1934 will run well above the levels of 1932 and 1933. Practically all of the $3,000,000,000 available to the PWA has been allotted, and President Roosevelt is exerting every pressure to accelerate the process of awarding contracts and beginning work. Moreover, Secretary Ickes signified his intention to ask Congress for an additional appropriation of $1,500,000,000. Congress will undoubtedly be in a mood to grant it. The number of people remaining out of work is sufficiently large to put pressure on the government to continue a liberal construction policy. This engineering construction embraces projects such as bridges, highways, sewerage systems, and water-front developments. Materials required are largely of the heavy type, like steel and cement."

And, it might be added, these same projects will require engineers and architects to design them and contractors to build them!

# PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

## *Highway Research Abstracts on Variety of Subjects*

A "Summary of Papers and Reports" presented before the thirteenth annual meeting of the Highway Research Board, held in December, has been made available in the form of an 18-page multigraph issued by the Highway Research Information Service, 2101 Constitution Ave., Washington, D. C. The subject-matter of the abstracts includes the following:

(1) Coefficient of Friction Between Tires and Road Surfaces, by Karl W. Stinson and C. P. Roberts (Ohio State University).

(2) Crack Control in Concrete Base Under Sheet Asphalt Pavement, by John V. Keily (Rhode Island).

(3) An Experimental Road of Cement-Bound Macadam, by E. M. Fleming and A. A. Anderson (Portland Cement Association).

(4) Studies of the Effect of Calcium Chloride on Portland Cement, by L. S. Wells (U. S. Bureau of Standards).

(5) Use of High Elastic-Limit Steel as Concrete Reinforcement (in highway construction), by H. J. Gilkey (Iowa State College).

(6) Weathering Tests on Concrete, by L. O. Hanson (University of Wisconsin).

(7) Concrete Pavement Cured with Cement Spray, by Searcy B. Slack (Georgia).

(8) Report of Project Committee on Curing of Concrete Pavements, by F. C. Lang, chairman.

(9) Progress Report on Maintenance Costs, by H. K. Bishop (U. S. Bureau of Public Roads).

(10) Maintenance of Concrete Pavement Cracks and Expansion Joints.

Copies of the multigraph containing the foregoing abstracts may be obtained by addressing Roy W. Crum, Director, Highway Research Board, 2101 Constitution Ave., Washington, D. C.

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## *Effect of Calcium Chloride on Portland Cement*

A PAPER presented before the thirteenth annual meeting of the Highway Research Board in Washington in December (1933), by L. S. Wells, chief of the Lime and Gypsum Section, U. S. Bureau of Standards, comprised a short progress report of the investigations being conducted by members of the Calcium Chloride Association Fellowship at the U. S. Bureau of Standards on the effect of calcium chloride on portland cement.

The paper takes up briefly (1) the reactions between calcium chloride and certain constituents of cement, notably tricalcium aluminate, followed by (2) a resume of the investigation of the effect of calcium chloride on eleven commercial cements, including eight gray portland cements, two white portland cements and one high-early-strength cement.

This includes (a) the quantity of heat evolved at the end of 24 hours and the maximum temperature attained during this period as the reactions with water proceed without and with the presence of ½, 1, 1½ and 2 per cent $CaCl_2$; (b) the effect of the same quantities of $CaCl_2$ on the setting time of these cements; (c) on the compressive strength of 1:3 standard mortar cubes broken at the end of 1, 3, 7, 28, 90 and 365 days, concluded by (d) a comparison of the compressive strength of 1:2:4 concretes (6½ gallons of water) made from these eleven cements without water and with the addition of 1, 1½ and 2¼ per cent $CaCl_2$, respectively, when broken at the end of 1, 3, 7, 28 and 90 days.

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## *Fourth Inspection Tour of Cement Reference Laboratory*

The Cement Reference Laboratory, a joint project of the U. S. Bureau of Standards and Committee C-1 of the American Society for Testing Materials, is now preparing for a fourth inspection tour among cement testing laboratories. Those laboratories which desire this inspection service should address their requests to the Cement Reference Laboratory at the Bureau of Standards.

Applications for inspection should be filed promptly. Laboratories affected by the ruling of the Bureau of Public Roads, or requirements of other offices, necessitating Reference Laboratory inspections at certain intervals, should particularly give their attention to this matter, since this tour will in general provide the only opportunity for the inspection of a laboratory during the next year or two.

It is required that laboratories remedy deficiencies in methods or apparatus, particularly any deficiencies which have been pointed out in reports of earlier inspections. Such improvement must be made prior to the inspector's visit.

The requirements for appartus and methods are contained in the Standard Methods of Sampling and Testing Portland Cement, A. S. T. M. Serial C 77-32. The 1932 revision of the A. S. T. M. Manual of Cement Testing also contains information of value to the cement laboratory operator.

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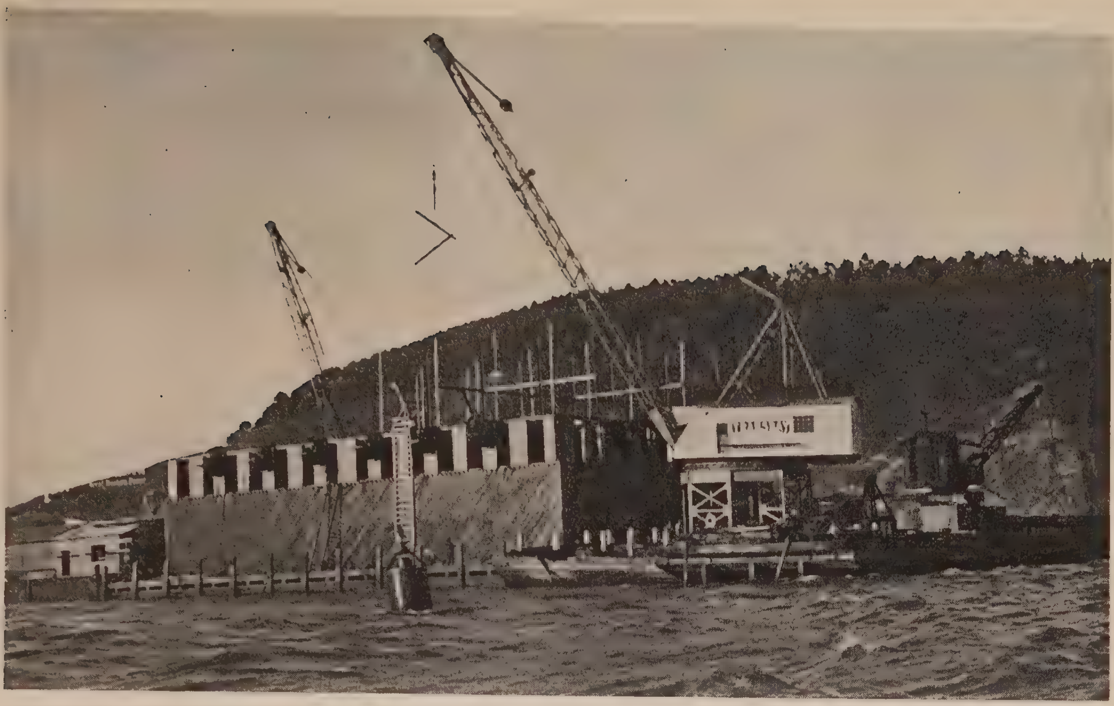
## *Revised A. S. T. M. Specifications for Reinforcing Steel*

VOTES by letter ballot cast since the 1933 annual meeting of the American Society for Testing Materials have resulted in adoption of proposed changes in standards pertaining to steel for concrete reinforcement.

Revisions were made in standard A82-27, for Cold-Drawn Steel Wire for Concrete Reinforcement.

Other revisions were made in sections 2, 6, 7(a) and 9 of standard A16-14, on Rail-Steel Concrete Reinforcement Bars.

Revisions were made, likewise, in sections 3, 10, 11(a) and 13 of standard A15-30, on Billet-Steel Concrete Reinforcement Bars, and a new section 15 was added.



**Sinking compressed air flotation caisson for pier No. 6 on San Francisco - Oakland Bay Bridge**

*Courtesy California Division of Highways, Department of Public Works*

# Employ New Methods to Sink Caissons for Massive Concrete Piers

THE substructure of the San Francisco-Oakland Bay Bridge, a proposed toll-bridge financed in part by RFC funds, has given rise to a novel method of sinking caissons for all the deep-water concrete piers between San Francisco and Yerba Buena Island. The method, devised by Daniel Moran, consulting engineer, is described as a compressed air flotation method.

## Details and Dimensions

The caisson for pier No. 6, shown in the illustration, is typical, though it is not the largest on this project. This caisson consists of a huge rectangular structure, 74 ft. 6 in. wide and 127 ft. long, provided with a steel cutting edge 13 ft. 6 in. high. The walls above the cutting edge are of timber.

Within the timber walls four rows of steel cylinders were placed, seven in each row. The lower 13½ ft. of each cylinder, however, is a square section, 15 ft. each way. The square sections thus extend the full height of the steel cutting edge. Each cylinder is then tapered up to a circular form 15 ft. in diameter, this diameter being maintained for the full height of the caisson.

## Procedure Followed in Sinking Process

When the caisson was located on the pier site, with the square and the tapered sections of the cylinders in position, concrete was deposited around the cylinders. The timber walls were then built up 20 ft. more, and a 20-ft. section was added to each cylinder, after which an additional lift of 20 ft. of concrete was placed. In this manner the weight of the concrete caused the caisson gradually to sink, as successive 20-ft. sections were added to the steel cylinders and 20-ft. lifts were added to the timber walls and the concrete.

During this sinking operation it was necessary to keep the 28 steel cylinders air-tight, so that the air pressure within them could be controlled. Accordingly, the cylinders were sealed at the top by means of metal domes welded to the top of the successive 20-ft. sections. When new sections were to be added, the dome on each cylinder was cut off, the new 20-ft. section was welded into place, and the dome was rewelded to the top of the newly placed section.

Mud was reached at pier No. 6 at a depth of 105 ft. below the mean water level. The domes were then permanently removed from the cylinders and dredging or excavating operations were started with 2-yd. clamshell buckets, by means of which the mud was lifted up through the cylinders from beneath the caisson.

In the meantime, the caisson walls were built up, sections were added to the cylinders, and concrete was placed between cylinders, as necessary to keep up with the settlement.

Solid rock was reached at the site of pier No. 6 at about 170 ft. below the surface of the water. Concrete was then deposited within the cylinders, to a height of 30 ft. above the rock. This concrete was deposited under water, no effort having been made to pump the water out of the cylinders. This 30-ft. depth of concrete, therefore, serves somewhat as a footing to the entire pier.

The concrete part of the pier was built to a level of 40 ft. above the surface of the water, above which a steel tower will be erected.

## Acknowledgment

This method of procedure, as previously stated, was developed by Daniel Moran, one of the consulting engineers for the San Francisco-Oakland Bay Bridge. C. H. Purcell is chief engineer.

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Condensed from an article by C. H. Purcell in October-November, 1933, issue of *California Highways and Public Works.*

# Metropolitan Paving Project Built in Winter Weather

### Grade Separation Structures, Concrete Pipe Storm Sewers, Sand Fill and Grading Completed in Winter—Start Placing Concrete Slab in Early Spring

THE construction of a northerly extension to Lincoln Park Outer Drive, in Chicago, during the winter of 1932-1933, supplies an admirable example of successful planning and organization by means of which a complicated metropolitan paving project may be carried forward throughout the winter months.

### Most of Work Done in Winter Months

Essentially, the winter work included everything except the actual placing of the concrete pavement slab. It included the placing of the sand fill, general leveling of the subgrade, construction of a storm sewer system, and construction of two highway grade separations and a pedestrian under-pass. When spring arrived, everything was in shape to start immediate placement of the concrete slab.

### Concrete Pipe Sewer System

All of this work was pushed forward with but little interruption because of cold weather. Thus for the storm sewer system concrete pipe were employed for the sewers and drains, and concrete block for the manholes. Because of the sandy character of the newly placed fill, sheeting and pumping had to be resorted to in all the large sewers; but there was less trouble from this source than would have been the case in summer. Placing of the concrete pipe, quite naturally, was not affected by weather conditions, while the curved concrete block for the manholes were set on comparatively mild days and the newly placed work was covered.

### Concrete Materials Heated

Concrete for the structures—two grade separation structures and a pedestrian under-pass—was placed in a warm condition. The mixing water was heated for this purpose, and, when the weather was cold enough to require it, the aggregates were heated. The purpose was to place the concrete at a temperature of not less than 50 deg. F. in the forms.[1] After the warmed concrete was placed it was protected with tarpaulin enclosures, and the air within the enclosures was kept warm with salamanders.

No serious difficulties were encountered during the concreting of these grade separation structures. Well points were used on one, and sheeting on the other.

The ramps of the grade separations have a new feature in the form of white cement raised dividing lines in the center and white cement facing on side curbs and gutters, as guides to traffic. This feature is especially valuable at night. The minimum width of ramps is 19 ft., and only right-hand turns can be made.

### Placing the Main Pavement

On the straight-away part of this project the sand fill was settled by inundation, as a result of which it became thoroughly compacted.

The main pavement consists of two 40-ft. concrete roadways, separated by a 52-ft. parkway except at the grade separations, where the parkway is 8 ft. wide.

In advance of concreting operations, the subgrade was prepared just for enough ahead of the mixer to prevent interruption of work. Immediately after preparation, the subgrade was wet down. It was soaked again just ahead of the mixer, and a third time behind the mixer just before placing concrete. Calcium chloride was used for curing.

This work was built by the Illinois State Division of Highways under the authority of a state law passed in 1931. H. J. Corey was resident engineer. The contractors were the C. E. Carson Company, of Chicago.

The excellent engineering design of this project is in itself a meritorious accomplishment. The careful planning devoted to the construction end of the work made it an outstanding example of winter paving construction.

Extension of Lincoln Park Outer Drive, Chicago, was a notable success in winter construction of metropolitan paving projects

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[1] It is suggested that 60 deg F. should be the minimum temperature of the concrete as it reaches the forms.—EDITOR.

# Many Uses for Vibrating Equipment in Cast Stone Plant

By GEORGE B. PICKOP
Asst. Superintendent, Malleable Iron Fittings Co., Branford, Conn.

AT the cast stone plant of the Dextone Decorative Stone Co., New Haven, Conn., extensive use is being made of several types of high-frequency vibrating equipment, in different classes of work.

Molds of both wood and plaster are employed extensively, while gelatine molds are used for intricate work involving undercuts and other difficult details. All of these molds are designed to be rigid enough to withstand the action of vibrators. Sand molds, likewise, are employed for some work.

The proportioning of aggregates, cement, and water at the Dextone plant involves no special problems, but several distinct advantages in proportioning are obtained as a result of the use of high-frequency vibrators. To begin with, since the vibrators have been installed the proportion of fines has been reduced considerably. This is a step in the right direction, since it is now well known that an excess of fines may result in crazing. In the second place, the use of the vibrators permits the use of a lower water-cement ratio and a drier consistency than were formerly possible; and this, again, is a step in the direction of increased strength. In a word, the mixtures can now be proportioned in accordance with the known principles of concrete design, with the view of obtaining maximum strength and density. Roughly, it can be said that with the use of vibrators the strengths average about 100 per cent higher than formerly, while the absorption has been reduced from 7 to 3 per cent, by weight.

Still another advantage in the use of vibrators comes from the wider scope in texture, due to the fact that higher percentages of coarse aggregate can be employed in the mixtures. Vibration consolidates masses of relatively dry concrete, with relatively large proportions of coarse aggregate, in a manner that was impossible when ordinary puddling methods or the flow of the material had to be depended upon to fill the molds. This permits close approaches to cut or polished natural stone, since so much of the surface is actual stone aggregate. These products can be polished in 3 days, while before the vibrators were installed it was necessary to wait from 7 to 14 days before mechanical polishing was attempted.

The Dextone plant employs several manufacturing processes in its cast stone department. One is the hand or floor molding, the impression of the object being taken in the molding sand that is built up on the floor. Since it is impossible to vibrate the floor, a hand spade of the pneumatic vibrator type is inserted into the freshly placed concrete and put into action. The spade is held at an angle of 15 to 45 deg. with the vertical, the angle depending on the depth of the concrete in the mold. The vibrating action brings laitance to the surface, and this overflows into the sand.

Molds of wood, plaster or gelatine are usually filled on a vibrator table. On some of the work one large high-speed vibrator is mounted at the center of the table, which in turn is mounted on springs in its understructure; or the table is equipped with four small vibrators, one near each corner. This arrangement of four small vibrators, operating with a frequentcy of 9,000 to 10,000 vibrations per minute, is especially effective where the molds contain from 1 to 2 cu. ft. of concrete.

A slicing spade of the pneumatic vibrator type, the vibrating part being about 4 ft. long, was primarily designed for placing structural concrete in columns, building walls, bridge abutments, and similar locations where the material is placed in stages several feet deep. This has been useful in vibrating large units, cast in up-ended molds, and it is used similarly for vibrating large concrete tile.

Use of vibrator spade in manufacture of cast stone in sand molds, at plant of Dextone Decorative Stone Co., New Haven, Conn.

Experience at this plant has demonstrated the value of one feature of the Branford vibrating equipment employed, namely, its variable speed. It has been found best to operate the equipment at an idling speed (anywhere from 200 to 1,000 vibrations per minute) while the concrete is being deposited. Then, when the mold is filled, a short spurt of high-frequency vibration completes the work.

Dry mixtures require considerably longer periods of vibration than the more plastic mixtures.

Branford vibrators can be operated by any air compressor equipment capable of delivering approximately 15 cu. ft. of compressed air per minute at a pressure of 60 to 80 lb. per sq. in.

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Reprinted from September-October (1933) *Journal* of the American Concrete Institute.

# HOW TO DO IT

**◆ Questions and Answers ◆**
**Consultation and Comment**

***A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.***

## Performance of Terrazzo Floors

*We are aware that in the United States and Canada many terrazzo floors are being placed with brass or aluminum strips as safeguards against visible cracking.*

*Can you tell us something of the results of experience with such floors? Do they show cracks in spite of the brass or aluminum strips? Would a contractor be safe in guaranteeing such work against cracking? Is there any noticeable difference in the efficiency of aluminum as compared with brass strips? Does the use of white cement give better results, as to shrinking and cracking, than ordinary gray portland cement? Are terrazzo floors made with white cement harder to keep clean than if ordinary gray cement is used?—B. F. T., Melbourne, Australia.*

The above inquiry was referred to J. M. Fuhrman, secretary of the National Terrazzo and Mosaic Association, Louisville, Kentucky. His comprehensive discussion of the subject will be of very definite value to contractors, architects and engineers, for which reason it is given here in full.

"The use of brass division strips in terrazzo work is quite recent," writes Mr. Fuhrman. "The art of placing terrazzo, however, is very old. Experiments have been made almost from the very beginning of the introduction of the metal division strips with different types of metal—brass, copper, aluminum, white metal zinc.

"At the present time most of the manufacturers are abandoning the use of aluminum and are concentrating on brass and white metal zinc, which are found to be most satisfactory.

"A number of patents have been issued to persons who claim that they have devised a method of placing terrazzo over wood and concrete, as well as other surfaces, so that it will not crack. The action of terrazzo as a floor finish is similar in every respect to a cement finish applied at the same place. Terrazzo is purely a different kind of surface, composed of cement and marble chips well worked and later ground to a smooth surface. A cement finish in the same place would consist of pure cement and sand well trowelled to a smooth surface. When terrazzo is applied monolithically it is naturally subjected to the expansion and contraction of the structural slab on which it is placed. There is no more tensile strength to terrazzo than will be found in a high class cement finish.

It is possible to place brass division strips in such a manner that the movement of the structural slab will be transmitted to the finished terrazzo surface only along the lines marked by the division strips. Many contractors fail to note the joints which occur in the structural concrete slabs and the settlement and expansion cracks which will take place in the main building structure before the terrazzo finish is placed. For these reasons certain types of monolithic floors are very badly cracked up even though the workmanship and materials are of a high class nature.

"In one of the larger cities of the central area of the United States, the board of education has made a study of the cracks which occur in the terrazzo corridors and has found that almost in every case the structural concrete slab had moved, and this was transmitted to the exposed terrazzo finish. They now make a complete survey of each of their buildings before the terrazzo finish is placed and definitely mark on a set of plans prepared for that purpose the positions in which they want the division strips installed, irrespective of any pattern, and the results are most gratifying.

"A great many contractors, whether they are cement contractors or terrazzo contractors, are afraid of white cement. Whether it is because the cement companies have not taken sufficient time to instruct the various contractors in the use of white cement, I do not know, but it is not uncommon for contractors to assure architects and owners that a white cement job does not have the strength, nor will it give the satisfaction obtained from regular gray cement. Experience, however, does not substantiate any of these claims. White cement used in terrazzo work is found most satisfactory and its working, wear-resisting qualities, and other physical properties, except color, are equal, if not superior, to gray cement. There is no reason why white cement should check, craze or crack any more quickly than gray cement.

"The great difficulty with all types of floors, whether cement, terrazzo, marble, or tile, is the lack of care which the owners give to them. They little realize that all of the materials which go into the composition of a hard surface floor of any description have a number of small holes in which the dirt and other foreign materials accumlate. Poorly paid janitors as a rule are responsible for the dirty conditions of most floors. But many owners refuse to furnish the proper cleansing materials and for that reason many terrazzo, cement and other floor surfaces present a very poor appearance.

"Terrazzo as a surface is long-wearing, durable, sanitary, attractive, and easily cleaned. It is as important to use good cleansers and keep the installation in good condition as it is to make a good installation originally."

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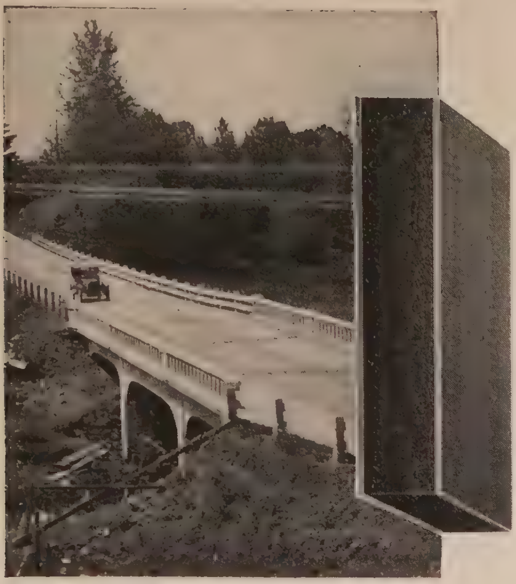
## Blending Silica with Portland Cement

*I have read with special interest your article in the October* (1933) *issue of* CONCRETE, *entitled "Blend of Silica and Portland Cement Modifies Quality of Concrete," as well as a similar article on page* 15 *of the issue of August,* 1933.

*Inasmuch as both these articles were condensed from more detailed reports, can you tell me where copies of the complete papers may be obtained?—R. B. K., Dorchester, Mass.*

The full text of the report abstracted in the October number can be found in the 1933 *Proceedings* of the American Society for Testing Materials. The one abstracted in the August issue may be consulted in the 1933 *Proceedings* of the American Concrete Institute.

# SERVICISED



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# ORGANIZATIONS

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AMERCIAN CONCRETE INSTITUTE; Harvey Whipple, Secretary, 7400 Second Blvd., Detroit, Mich. Thirtieth annual convention, February 20-22, Royal York Hotel, Toronto, Canada.

AMERICAN CONCRETE PIPE ASSOCIATION; M. W. Loving, Secretary, 33 West Grand Ave., Chicago.

AMERICAN ROAD BUILDERS' ASSOCIATION; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.

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RAIL STEEL BAR ASSOCIATION; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

WIRE REINFORCEMENT INSTITUTE; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

WISCONSIN CONCRETE PRODUCTS MANUFACTURERS' ASSOCIATION, INC.; L. E. Schwalbe, Secretary, Wauwatosa, Wis.

# New Books and Pamphlets

## Qualifications for Engineering Career

Vocational Guidance in Engineering Lines. Published under the auspices of the American Association of Engineers, by the Mack Printing Company, Easton, Penna. Supervised by J. A. L. Waddell, Frank W. Skinner, and Harold B. Wessman, members of editorial committee. Single volume, 550 pages, 50 illustrations. Price $2.50.

This book presents the views of a number of well-known engineers on the character of engineering work and the qualifications necessary in an individual who proposes to follow engineering as a career. The central object of the book is that of aiding technical schools in selecting engineering students of the best possible type, and to encourage such schools to exclude applicants who are clearly unfitted for the profession of engineering.

## Design of Complex Structures

Methodes De Calculs Des Constructions Complexes (Methods of Design of Complex Structures), by Auguste Lievin. Published by Le Constructeur de Ciment Arme, 148 Boulevard de Magenta, Paris, France. Paper cover, 250 pages, 6¼ by 9½ in. Illustrated with numerous line diagrams. Price 54 francs.

The analyses and formulas given in this book cover structures of the rigid-frame type, of various degrees of complexity such as the designer encounters in the calculation of stresses in reinforced concrete bridges, viaducts, and industrial buildings.

## The Cement Gun

The Cement Gun and Its Sand-Cement Product "Gunite" is the title and sub-title of a 49-page publication just issued by the Cement Gun Company, Allentown, Pennsylvania.

This publication gives comprehensive details of the use of "Gunite," and in addition it contains much engineering data and suggested forms of specifications. A new development that is considered of major importance in cement gun work is the nozzle-velocity meter, the application of which is fully explained.

## Characteristics of Ciment Fondu

The Characteristics of Ciment Fondu is the title of a 64-page cloth-bound book published by the International Non-Staining Cement Co., Inc., Brooklyn, N. Y.

Much engineering data of definite interest to concrete construction interests will be found in this book. The chemical analysis of this cement, its chemical composition and the chemical reactions during setting and hardening are some of the subjects treated.

## Index of Federal Specifications

Index of Federal Specifications, issued by the Federal Specifications Board, Washington, D. C., as of October 1, 1933.

This is a new Index, brought down to date, and contains reference to a number of specifications related to cement and concrete construction. Copies may be obtained at 10 cents each from the Government Printing Office, Washington, D. C.

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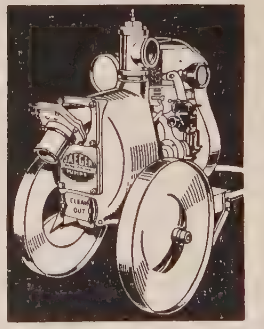

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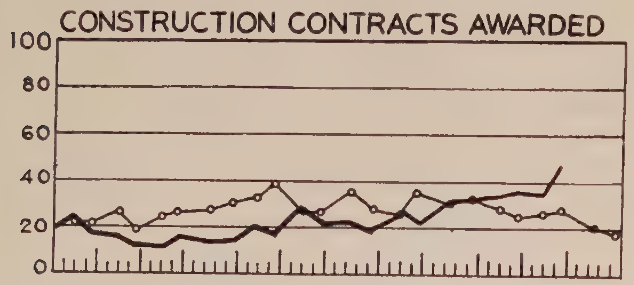
## Construction Contracts in Sharp Increase

### Figures at Largest Monthly Total Since October, 1931—Residential Construction Shows Upturn

THE highest monthly total of construction contracts since October, 1931, was awarded in November in the 37 states east of the Rocky Mountains, according to figures given out by L. S. Schnitman, of the F. W. Dodge Corporation. The November total was $162,330,600.

Most significant of all, the Dodge report points out, was the sharp upturn in residential building. Of further significance is the historical fact that residential construction was the first to start the upward climb out of the depression of 1921. The encouraging feature about this fact is that the present upturn, though due mainly to PWA contracts, is not entirely due to that cause.



The sharp upturn in construction in the second half of November is shown quite impressively in the diagram. The heavy line represents the volume of construction contracts in 1933, and the light line the contracts for 1932, both expressed as a percentage of the figures for 1923 to 1925.

## From the Patent Office

By J. KAPLAN

Patent Attorney, Washington, D. C.

**Automobile highway safety wall:** Martin L. Sory, Bellingham, Washington. U. S. Pat. 1,927,189, Sept. 19, 1933.—The invention consists of a marginal safety wall along a roadway, having the side toward the roadway continuously curved upward and inclined outwardly, and an overhanging convex coping on top of the wall.

●

**Tunnel construction apparatus:** Frederic L. Copeland and Rasmus Rasmussen, Chicago, Illinois. U. S. Pat. 1,927,256, Sept. 19, 1933.—The apparatus consists of a carriage to support and transport forms for tunnel lining. Arms project laterally from the carriage, while jacks on the outer ends of the arms engage and support side-wall forms. Jacks on upwardly directed arms support the overhead arch forms.

## Coming Conventions

*January 17-20*—American Society of Civil Engineers. Annual. New York City. C. E. Beam, Asst. Secy., 33 W. 39th Street, New York City.

*January 22-25*—American Road Builders' Association. 31st Annual Convention and Highway Exhibit. Stevens Hotel, Chicago, Illinois.

*January 22-27*—National Sand and Gravel Association. 18th Annual. National Crushed Stone Association. 17th Annual. National Slag Association. 16th Annual. Netherland Plaza Hotel, Cincinnati, Ohio.

*February 8-9*—The Engineering Institute of Canada. 48th Annual. Windsor Hotel, Montreal, Quebec, Canada. R. J. Durley, Gen. Secy., 2050 Mansfield St., Montreal.

*February 19-20*—National Concrete Masonry Association. Annual. Royal York Hotel, Toronto, Canada. D. R. Collins, Asst. Secy., 33 W. Grand Ave., Chicago.

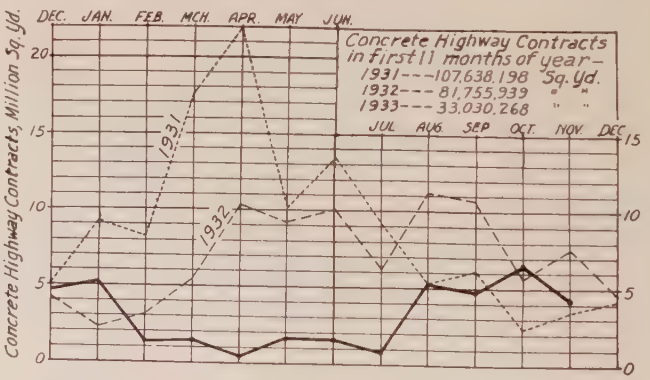
*February 20-22*—American Concrete Institute, thirtieth annual convention. Royal York Hotel, Toronto, Canada.

*March 4-11*—Leipzig Trade Fair, Leipzig, Germany. 1934 Spring Fair with Exhibits. Leipzig Trade Fair, Inc., 10 E. 40th St., New York City.

*June 25-29*—American Society for Testing Materials. Annual. Chalfonte-Haddon Hall, Atlantic City, N. J.

## November Highway Contract Awards

CONTRACTS for concrete highway construction reached the moderate total of 4,170,798 sq. yd. in November, according to figures compiled by the highways bureau of the Portland Cement Association. This is considerably less than the awards made in November, 1932, but more than the corresponding month of 1931.



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Total awards for the first 11 months of 1933, including concrete streets and alleys as well as concrete roads, amount to 39,210,000 sq. yd.

## Brookmire Special Report on Building Outlook for 1934

*(Summary of Brookmire Economic Service Report dated December 11, 1933)*

**ENGINEERING construction (public works and utilities) will dominate the building industry in 1934 with a huge gain over 1933 levels. Privately financed building also will probably gain appreciably, though satisfactory financing conditions will be necessary in order to make the increase a big one. It appears likely that if necessary the government will set up financing machinery at least for home building. The amount of money spent for maintenance, repairs and modernization of old structures will be materially greater, and this field is sufficiently attractive to merit its cultivation by building interests.**

# BOOKS On Concrete

**The books listed below have been carefully selected by our editorial staff as useful to those engaged in making concrete in all its various forms. Prices are cash in advance and include postage.**

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**DESIGN AND CONSTRUCTION OF FORM WORK FOR CONCRETE STRUCTURES.** By A. E. Wynn. 312 pages, 219 ills., 12 folded inserts and 11 design tables. Cloth bound, stamped title in gold. Price $6.00

"Wynn's Book" is a phrase commonly known to engineers, designers, and foremen, and is heard wherever concrete construction is under way. This book covers every phase of forms for concrete construction, and is fully and completely supplemented with many significant illustrations, tables and drawings and printed on a superior grade of enameled paper.

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**CONCRETE CONSTRUCTION MADE EASY.** By Leslie Turner and Albert Lakeman. 113 pages, 65 illustrations, 16 tables. Cloth bound. Price $2.00

A practical book that solves problems in the design and erection of any type of concrete structure. Full designs with tables and all necessary information for building of foundations, walls, columns, floors, roofs, staircases, beams, water tanks, retaining walls, lintels, formwork, saw-tooth roofs, etc. A mine of information to the novice and a fruitful source of advice for the experienced. Written clearly and plainly.

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**MANUFACTURE AND USES OF CONCRETE PRODUCTS AND CAST STONE.** By H. L. Childe. 354 pages. 265 illustrations. Color plates. Photographs. Completely rewritten and enlarged. Price $3.00

Deals with problems of how to: use dry mixes for architectural concrete; minimize crazing and efflorescence; design all kinds of molds; select materials; grade and proportion aggregates, regulate mixing, and govern curing; use color in concrete; manufacture columns, cornice posts, curb, blocks and slabs, brick, roofing tile, steps, sills, lintels and edgings, balustrades, sundials, bird-baths, lettered panels, ornamental work, etc. This new 1930 edition simplifies every phase of manufacture of concrete products and cast stone of every description for every purpose.

---

**BASIC PRINCIPLES OF CONCRETE MAKING.** By Franklin R. McMillan, Director of Research, Portland Cement Association.

The author has culled the essentials out of a mass of scientific data on this subject and presents them with force and directness in this book. He shows the effects of quality of material, of proportioning, mixing, working and curing on the finished concrete.

The importance of variable mixes; tests for permeability; how to obtain strength, durability and watertightness; effective ratios; importance of proper construction methods—these and many other vital topics are discussed fully and authoritatively.

The book represents not only extensive accumulated knowledge, but also wide practical experience in the field and laboratory. It is an enlargement and revision of a series of notable articles on concrete mixing by Mr. McMillan published in 1929.

Ninety-nine pages, 6x9½, 32 illustrations and tables. Postpaid. Price $2.00

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**CONCRETE MONUMENTS, MAUSOLEUMS AND BURIAL VAULTS.** By A. A. Houghton. 65 pages, illustrated. Paper bound. Price $.75

The molding of concrete monuments to imitate the most expensive cut stone is explained in this treatise, with working drawings of easily built molds. Cutting inscriptions and designs is also fully treated.

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***MOLDS FOR CAST STONE AND CONCRETE.** By F. Burren and G. R. Gregory. Heavy board cover, 79 pages, 11 by 7½ in.; 44 full page illustrations. Price $1.25

Detailed working drawings for the practical mold maker, covering a wide range of concrete and cast stone products. Drawings supply the necessary information, and brief descriptions are given in each case.

A lot of good information, not only for cast stone manufacturers, but for makers of special products made of ordinary concrete, such as fence posts, chimney caps and pots, well linings, laundry tubs, etc.

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***GENERAL ENGINEERING HANDBOOK.** By Charles Edward O'Rourke and 29 associates. Flexible cover; 921 pages, 5 by 8 in., numerous tables, diagrams and illustrations. Price $4.00

This book assembles a great amount of fundamental engineering data in usable form. 31 separate sections deal with as many specific branches of engineering.

Of particular interest to engineers who specialize in the use of concrete as a structural material are sections devoted to "Highway," by Thomas R. Agg; "Reinforced Concrete Structures," and "Stresses in Framed Structures," by Charles Edward O'Rourke; "Engineering Materials," by Herbert H. Scofield; "Foundations," by Roland P. Davis; and "Mechanics," by Alfred P. Poorman.

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**REINFORCED CONCRETE CONSTRUCTION.** By George A. Hool, Professor of Structural Engineering, University of Wisconsin. University of Wisconsin Extension Series.

Vol. I—Fundamental Principles. Third Edition. 380 pages, 6x9, 139 illustrations, 18 tables, 28 diagrams ........ $3.50

Vol. II—Retaining Walls and Buildings. Second Edition. 700 pages, 6x9, illustrated........ $6.00

Vol. III—Bridges and Culverts. 688 pages, 6x9, over 600 illustrations, 41 plates........ $6.00

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***CONCRETE ENGINEERS MANUAL.** By Samuel Baker and A. DeGroot. Cloth, 401 pages, 5 by 7½ in., numerous drawings, charts and tables. Price $3.00

This volume is intended as a textbook for students of concrete engineering, and as a reference book for designers, foremen, inspectors, and others involved in the design of concrete structures and in the making and placing of concrete.

The book contains a complete description of the modern methods of proportioning concrete mixtures, mixing and placing concrete and steel, and providing waterproofing. Mathematical tables and the fundamental principles of mathematics and mechanics of materials, as applied to reinforced concrete designs, are included.

Among other subjects treated in individual chapters are form work, foundations, design of retaining walls, and estimating concrete work.

---

**CEMENT CHEMISTRY IN THEORY AND PRACTICE.** By Prof. Dr. Hans Kuhl, Director of the Institute for Cement Research, Berlin. Translated into English by J. W. Christelow, B.Sc. 64 pages, 6 by 9, cloth cover. Illustrated with a number of halftones and diagrams. Price $2.50

An authoritative book on the chemistry of cement, a translation of a series of lectures delivered by Dr. Kuhl in Moscow, at the special request of the Soviet government. The author presents the most up-to-date knowledge of the subject in simple language. The translator is one who knows his subject very thoroughly. The result is a concise record of modern research on the manufacture and setting of cement.

CONTENTS

1. The development of Cement Research.
2. The Theory of Cement Burning.
3. The Constitution of Portland Cement Clinker.
4. The Problem of Hardening and its Significance in Cement Research.
5. The Chemistry of High-Strength Cements.
6. The Technical Aspect of High-Strength Cements.

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**PRE-CAST CONCRETE FACTORY OPERATION.** By H. L. Childe, Editor, "Concrete Building and Concrete Products" (England). 190 pages, 5½x9, illustrations and layouts. Price $2.00

Complete descriptions of the plant layouts, equipment, methods, and processes of 20 English manufacturers, large and small. Includes the whole range of pre-cast units from the largest cast stone and roofing tile and plain block plants to the small producers of miscellaneous products.

## SPECIAL COMBINATION OFFER To Regular Subscribers:

$1.50 (or $2.00 for Cement Mill Edition) added to the price of any of the above listed books will extend your present subscription one year from its present expiration date. Foreign and Canadian subscribers please write for details.

*Newly listed.

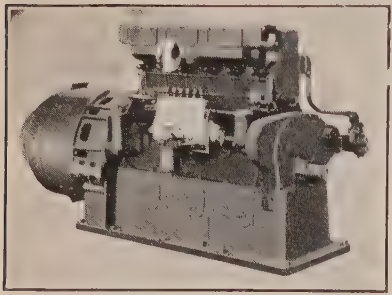
**Book Department of CONCRETE, 400 West Madison Street, Chicago, Ill.**

# EQUIPMENT AND MATERIALS

## Light Diesel Generating Set

The Buda Company, Harvey, Illinois, has developed a light compact Diesel generating set which is said to produce current at approximately ¾ to 1c per kilowatt. These sets range in size from 10 to 90 KW, alternating and direct current.

These engines do not require the services of an attendant, aside from an occasional visit to the engine room, possibly two or three times a day, it is claimed. They are suitable for 24-hour service.



Diesel Generating Set

A small compact generator set fitted with a natural gas or gasoline engine of similar design has also been put on the market recently by the same company, ranging from 5 to 75 KW.

•

## A Surface Preserver

Acqua-Seal is a surface preserver said to penetrate and stop leaking porous walls, efflorescence, soot stains and water blotches.

It is a common sight to see concrete walls with their exterior surfaces marked or with large portions spalled off—primarily caused bv the entrance of water into the pores. Freezing, chemical reactions, and rust pressures as a result of the attack upon the reinforcing are the causes.

•

## Pay Load Capacity

Those who need bigger trucks but can't afford them will be interested in the Thornton dual-ratio positive four-wheel drive—a tandem unit for installation on small trucks—offered by the Thornton Tandem Company of Detroit, Michigan.

Bigger loads carried by smaller trucks at a reasonable profit without reducing the normal life expectancy of the truck is the aim. Because of the extra traction and balance, the makers claim the Thornton equipped small truck can be driven over all kinds of roads with surprising ease and economy. The dual-ratio feature, they say, offers a two-purpose truck with power for loads and speed for light or half loads.

### *Distributors for Chamotte*

The American Fluresit Company, of Cincinnati, has been assigned the territory comprising New York, Pennsylvania, Ohio, Indiana and Kentucky, for the distribution of Chamotte, a slag-like substance developed by Hugo Effenberger, of Racine, Wisconsin.

Other distributors are the Frank P. White Building Materials Co., of Minneapolis, and Lammens Process, Ltd., Los Angeles.

•

## Mud-Jack

The National Equipment Corporation of Milwaukee has developed a Mud-Jack for raising curb and gutter, sidewalk and street slabs, thereby eliminating the necessity of reconstruction and consequent high costs. The expense of the Mud-Jack method is surprisingly low, they say.

**Sidewalk raising with the N.E.C. Mud-Jack**

To correct the subgrade for maintaining the slab at its proper location, mud is pumped through holes drilled in the slab. The mud (dry black top soil mixed with cement approximately 20 to 1) fills the voids and raises the project to original grade.

•

## Circular Slide Rule

A metal circular slide-rule designed to be carried in the vest pocket has been placed on the market by the Tavella Sales Co., New York City, under the trade name Tasco. It is made of nickel silver discs, with the lines and figures etched in black. It is said to be grease- and water-proof.

## Manufacturers' News

### *Ryerson Builds Plant Extension*

*Joseph T. Ryerson & Son, Inc.,* have underway an extensive addition to their St. Louis steel-service plant. The new building will greatly increase facilities for storing and dispatching steel and allied products from that point. New, modern offices equipped with an air conditioning and cooling system will be included in the unit.

A circulating warm air heating system will provide the necessary distribution of heat for the proper storing of sheets, tool steels, welding rod, cold rolled bars, bands, hoops and other high grade steels.

•

### *Tuthill at the Road Show*

*Tuthill Highway Guard,* for highway and street transportation, will be exhibited in Booth 85 at the Road Show in Chicago, January 22 to 25, 1934. This exhibit of the Tuthill Spring Company, Chicago, Ill., will be of interest to road officials.

Motion pictures, showing elimination of accidents by using *Tuthill Highway Guard,* will be displayed.

## Industrial Literature

### *A Spherical Comixture*

*Colloy* is the trade mark applied to the workability admixtures marketed by the *Colloy Products Company* of St. Louis.

*Colloy for Concrete* is the title of a folder describing this manufactured mineral comixture or alloy for use in all types of concrete. An increase is claimed in the workability, strength, water tightness and durability, density and uniformity. The producers also claim that appearance and quality is improved.

•

### *Centrifugal Pumps*

Worthington Monobloc Centrifugal Pumps (two stage) is the title of a folder just issued by the *Worthington Pump and Machinery Corporation,* Harrison, New Jersey, covering types G, GA and GB.

Copies are available by writing the company on your business letterhead.

•

### *Chain Belt Distributor*

*The Chain Belt Company,* Milwaukee, announces the appointment of Dale and Rankin, Inc., of Newark, New Jersey, as distributors for their line of Rex construction equipment, pavers, building mixers, pumps, saw rigs, plaster and mortar mixers, and cold patch mixers.

•

### *Ryerson Buys Bacon and Company*

*Joseph T. Ryerson & Son, Inc.,* of Boston, New York and Chicago has purchased the stock and good will of Bacon and Company, iron and steel company of Boston.

Cement Mill Section of
Concrete

Vol. XLII
No. 1

JANUARY
1934

# New Clinker Cooler Reduces Arkansas' Fuel and Grinding Costs

### Heat Recuperation a Leading Feature—Distinct Improvement in Grindability of Clinker and Early Strength of Cement —Performance Record Shows Profitable Results

EARLY in 1933 the Arkansas Portland Cement Company had a new type of clinker cooler installed at its plant at Okay, Arkansas, from which the company has realized very profitable results.

The new cooler is known as the air-quenching type, developed by the Allis-Chalmers Manufacturing Company, of Milwaukee. The cooler unit, installed at right angles to the rotary kiln shown in the view of the Okay plant, is 4 ft. 6 in. wide and 80 ft. long. It is hooked up with the kiln just mentioned, which in turn is 300 ft. long and 11 ft. 6 in. in diameter.

**View of Okay plant of Arkansas Portland Cement Co. The new clinker cooler here described is hooked up with the rotary kiln shown**

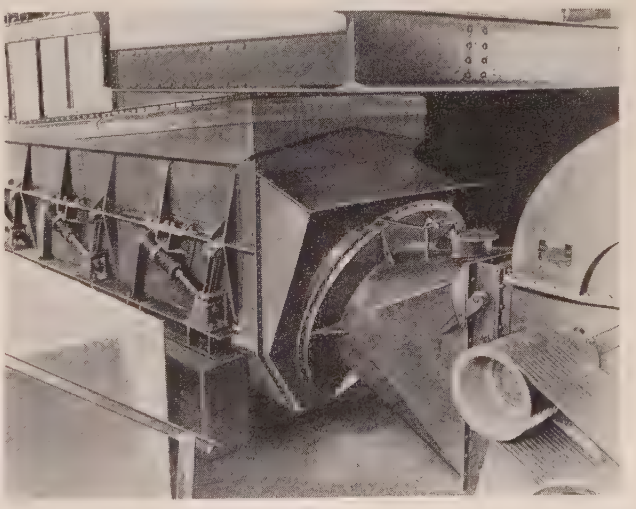
## Operation of Cooler

The air-quenching cooler consists of an upper stationary housing, properly insulated, and below the upper stationary housing is a reciprocating housing equipped with grates. The housings are both approximately rectangular in cross section and the space below the grates in the reciprocating housing is an air passage. Air from a blower passes into this housing and goes up through the grates and through an agitated bed of clinker, where it absorbs heat from the clinker. The hot gases in the stationary housing are either delivered direct to the kiln or are mixed with the gas fuel being delivered to the kiln. Excess air from near the discharge end of the cooler, which is comparatively cool, is sent to a stack or ventilator.

## Features of Cooler

The outstanding features of the cooler installed at the Arkansas plant may now be summarized. At the feed end of the cooler the grates are constructed of heat-resisting castings. That portion of the grate on which the clinker falls directly from the kiln is constructed of castings 3 in. deep, the remainder of the casting grates being 2 in. deep.

The installation of the cast grate bars at the feed end of the cooler not only provides a grate that withstands extreme temperature conditions, which may be encountered if the air supply is temporarily interrupted, but also forms a rigid carrying surface which will resist shock occasioned by large pieces of clinker falling from the discharge end of the kiln. The balance of the grates are made of round steel rods $1/4$ in. in diameter, with 1/16-in. spaces between them. This opening is maintained accurately with cross angles spaced at about 1-ft. intervals.



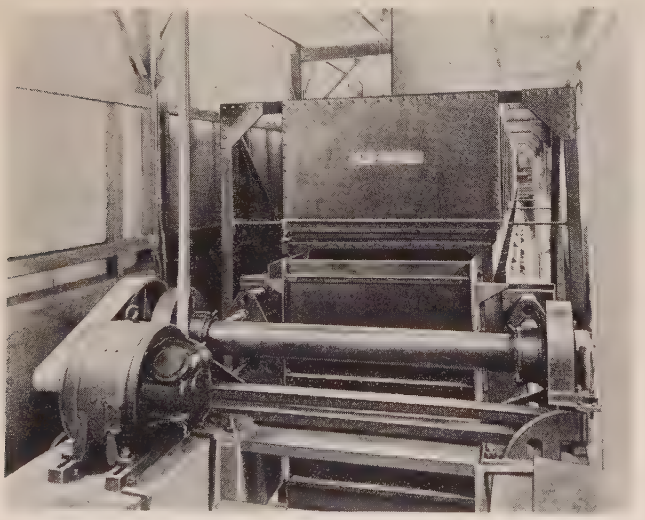
**Feed end of new air-quenching type of clinker cooler**

All of the grates are made up in sections that are easily handled in case replacement is necessary. The reciprocating body which carries the grates is carried on support arms and the inertia of the reciprocating parts is balanced by means of coil type balancing springs. The balancing springs which are mounted on the side of the reciprocating lower housing are supported on a base plate, which consists of heavy type "H" beams properly reinforced.

The reciprocating motion of the grate is produced by an eccentric shaft driven by a variable-speed motor. The power required to operate the shaking element of this cooler, handling a capacity of 140 bbl. per hour, is only 5 to 7 hp. The total power required, including the power for supplying the air, is considerably less than for a rotary cooler installation.

### Automatic Speed Regulation

A simple and reliable control system has been developed and installed for regulating automatically the speed of the cooler to accommodate variations in the rate of feed. This control is operated by a simple diaphragm pressure switch which is connected to the air duct below the grates of the cooler. As the rate of feed increases there is a tendency to build up a thicker bed of clinker on the grate. Increasing the thickness of material on top of the grate slightly increases the pressure in the air duct on account of the increase in resistance to the passage of air through the bed of material. The slight increase in pressure reacts on the diaphragm, which successively operates four small mercury switches. The mercury switches are connected to the taps of the variable field resistance in the control of the cooler driving motor.



**Discharge end of new clinker cooler at Okay plant of Arkansas Portland Cement Co.**

In operation the cooler driving motor is automatically speeded up with a slight increase in feed to the cooler, and is slowed down when the rate of feed diminishes. This control system automatically maintains a predetermined depth of material on the grates, while the pressure in the air duct below the grate is held very uniform and seldom varies more than two-tenths of an inch above or below a predetermined point.

A method of operation has been developed which maintains an approximate depth of 2 in. of material on the grates, and requires an air pressure of only between 1 and 2 in., water gage, at the air supply. The result of this low air pressure is a very moderate amount of power required for supplying the total air for the cooler.

### Reduced Fuel and Grinding Costs

Previous to the installation of this cooler, the clinker was conveyed from the discharge end of the kiln to storage by means of a drag chain, and water was sprayed on the clinker while in transit. The outstanding savings and advantages as demonstrated by this installation are summarized in the following record of performance at the Okay plant.

(1) This cooler has operated at capacities averaging up to 150 bbl. per hour over 8-hour periods, and 140 bbl. per hour over 24-hour periods. The temperature differential between the cooled clinker and the air used for cooling averages approximately 25 deg. F.

(2) After the air-quenching clinker cooler was installed, the capacity of the clinker grinding mills, when grinding to the same fineness as previously, increased 25 per cent, with a corresponding reduction in power consumption per barrel ground.

(3) The fuel consumption has been reduced from approximately 1,800 cu. ft. of gas per bbl. to 1,600 cu. ft. per bbl., realizing a saving equivalent to approximately 200,000 B.t.u. per barrel of clinker, as a result of the recuperation of heat through the use of the air-quenching cooler.

(4) The clinker produced with the new cooler produces cement that has considerably higher early strength than that from the clinker previously produced with drag chain operation. This increase amounts to approximately 20 per cent on the 24-hour tensile tests and 15 per cent on the 7-day tensile tests.

The economies in fuel and grinding costs alone constitute a saving fully justifying the cost of this installation.

### Acknowledgment

As previously stated, the clinker cooler here described was manufactured and installed by the Allis-Chalmers Manufacturing Company, of Milwaukee, Wisconsin. The successful operation of this installation has demonstrated the soundness of its mechanical design. It has caused a distinct improvement in the quality of the clinker, in addition to bringing about a saving in fuel and grinding costs.

## Million Barrels of Cement in Norris Dam

FROM 800,000 to 1,000,000 bbl. of cement will be required for the construction of Norris Dam, one of the large individual projects in the Tennessee Valley development work inaugurated by the Federal government.

## Code for Manufacturers of Kilns, Coolers and Dryers

THE code of fair competition for the industry representing manufacturers of kilns, coolers and dryers, was given a public hearing at Washington on December 4, and is expected to be signed soon.

# Cement Code Provides Inducement to Rehabilitate and Improve

## Modernization of Existing Plants Is Definitely Permitted—How Manufacturing Cost Is Determined—Sharing Available Business—Room for Special Cements

THE code of fair competition for the cement industry was signed by President Roosevelt on November 27, as announced on page 36 of the December issue of the *Cement Mill Edition* of CONCRETE. The code was submitted on July 19 by the Cement Institute.

In his letter transmitting the code to the President for signature, General Johnson expressed the opinion that it complies in all respects with the pertinent provisions of Title I of the National Industrial Recovery Act, including, without limitation, subsection (a) of the much-discussed Section 7 of the Act, and subsection (b) of Section 10. He expressed the further belief that the code is not designed to promote monopolies or to eliminate or oppress the smaller plants.

### Hours, Wages, and Number of Employees

Hours of employment are permitted to be flexible over any half calendar year but are not permitted to be in excess of an average of more than 36 hours per week during this period nor more than 8 hours a day. Maximum hours of work are limited to 42 hours a week for employees other than clerical and office employees, who are limited to 40 hours. Employees in packing and shipping departments are limited to 10 hours a day and 36 hours a week averaged over any half calendar year. Employees engaged in executive, administrative, technical, sales, staff and emergency work are exempt from maximum hours.

Minimum wages are established in twelve geographical districts as defined by the U. S. Bureau of Mines. In two Southern districts a minimum hourly rate of 30 cents an hour is established. In a portion of two districts, 37 cents; in a portion of one district, 38 cents; in all other districts a minimum of 40 cents an hour is established.

Comparison of the production of portland cement in the years 1928 and 1932 shows a decline of 54 per cent. Comparison of number of persons employed by the industry shows a decrease from 34,244 employees in 1928 to 11,941 in February, 1933, or a decline of 68.8 per cent. It is estimated that, based on employment in 1932, the adoption of the average 36-hour week as proposed in the code will cause absorption by the industry of 5,618 additional workers and a payroll increase of approximately 40 per cent.

### Constitution of Code Authority

The Code Authority is to consist of seven individuals, appointed by the Board of Trustees of the Cement Institute, or a larger number if approved by the Administrator of the NRA. The President may, in his discretion, appoint not more than three additional members without vote to represent the Administrator.

The Board of Trustees of the Cement Institute shall be made up as follows:

(a) One member to be chosen from each geographical producing district designated by the U. S. Bureau of Mines.

(b) Trustees at Large, not to exceed seven in number, shall be chosen by those members of the Board who represent the cement districts.

(c) The president, the vice-presidents and the treasurer of the Cement Institute shall be ex-officio members of the Board of Trustees with full voting power.

The Code Authority shall be the general planning, coordinating and administering agency of the code. It may make such rules and regulations as may be necessary for the conduct of its business.

### Safety Work to Continue

As an evidence of the general attitude of the industry toward its employees, the industry invites attention to its achievements in the field of safety. For many years the industry has occupied the premier position in safety accomplishments. It has been regarded as an exemplar in safety technic; it received the Joseph A. Holmes awards for the years 1930 and 1932, which is more notable because during those declining and depression years, great difficulties were experienced in maintaining normal safety morale in plant organizations.

Such results, in the opinion of the industry, can be attained only by the co-operative effort of constructive management and satisfied, intelligent employees. The safety movement in the industry is conducted by, and for many years has been one of the constructive activities of, the Portland Cement Association, an organization of the industry which is devoted to research, education and improvement and extension of the use of concrete. So far as practicable, the safety movement will be continued.

### Plan for Sharing Available Business

The Board is authorized to formulate plans, within 30 days after the effective date of the code, unless such time shall be extended by the Administrator, for the equitable allocation of available business among all members of the industry or among members of the industry operating in one or more districts, and for the control of cement inventory, and to submit the same either to a meeting of all members of the industry or to meetings of members in the districts affected, as the Board may determine, for approval, modification or rejection. Each member of the industry shall be entitled to receive notice of any such

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Abstracted from Code of Fair Competition for the Cement Industry. Copies of the full code may be obtained at 5 cents each from the Government Printing Office, Washington, D. C.

plan and to participate in any meeting or meetings of all members of the industry or of members in the district in which such member operates and, further, shall have the right to appear before the Board at any meeting at which any such plan is being considered for the purpose of presenting any facts or arguments.

### Increase in Productive Capacity

Prior to the construction or operation of a new plant, or increase in the productive capacity of an existing plant, or moving all or part of such a plant from one place to another, the Cement Institute, on receipt of such information, shall promptly collect complete data concerning existing productive capacity in the area in which the proposed new plant is to be located, together with data pertaining to the consumption of cement in that area.

If the information collected discloses that the proposed new plant will result in further increasing the problem of over-production or over-capacity in such area, the Cement Institute may petition the President to prohibit the construction or operation of the proposed new plant, or the increase in manufacturing capacities of such existing plants.

**The provisions just mentioned shall not be construed to prevent the modernization of existing plants to improve the quality of the product and/or the operating efficiency.**

### How Manufacturing Cost Is Computed

It shall be an unfair method of competition for any member of the industry to sell or offer to sell cement at less than his expenses of manufacture, provided, however, that any member of the industry may sell or offer to sell cement at a price below his own expenses for the purpose of meeting the competition of any other member of the industry whose price is not less than the expenses of manufacturing of such other member.

Manufacturing expenses shall include all direct labor and material (which do not greatly vary per unit of production with volume of output), at cost or market, whichever is lower, plus a proportionate share of all indirect expenses, inclusive of maximum depreciation and/or depletion allowances computed according to federal income tax procedure, but exclusive of any capital reserves, for purposes other than depreciation and/or depletion, and exclusive of interest paid and development expenses. Provided, that the distribution of such indirect expenses per unit of product produced shall be on the basis of an average rate of utilization of plant facilities by efficient producers.

Unless and/or until some other formula is submitted to and approved by the Administrator, the average rate of utilization of plant facilities shall be determined as follows:

Each member of the industry shall send to an impartial agency appointed by The Institute, a consolidated income-tax return for that portion (or all) of his operations, devoted to the manufacture of portland cement for each of the years 1927-1932, or such other period as, upon presentation of official data, may be determined to be fair and will better effectuate the purpose and be approved by the Administrator, together with a record of physical production, productive capacity, and sales in each of these years.

From these reports will be calculated the average rate of utilization of productive capacity by the one-third portion of the industry which reported the lowest average per unit cost of production for such period.

This percentage of productive capacity (rather than full capacity) shall become standard for the distribution of indirect expenses and fixed charges for the purpose of determining the per unit manufacturing expenses, by every member of the industry.

### Standardization of Products

All portland cement marketed by members of the industry shall comply with the standard specifications for portland cement of the American Society for Testing Materials, and the American Standards Association, and/or the Federal Specifications Board. Members of the industry may sell cement under modified portland cement specifications that are designed to meet special or unusual conditions not adequately or properly covered by the specifications hereinabove referred to, provided, however, that the price at which such modified portland cements are sold shall be filed with the Code Authority.

Every member of the industry shall guarantee his products to comply with all the conditions of the specifications under which they are sold, but shall not be responsible for the improper use of cements and therefore shall not guarantee finished work, nor shall the member of the industry be responsible for the condition of his product after delivery.

No member of the industry shall pay or absorb, directly or indirectly, any charges for inspection or tests made by or on behalf of the purchaser to determine compliance with specifications therefor.

### Modification

The code is subject to the right of the President to cancel or modify any order, approval, license, rule or regulation issued under Title I of the National Industrial Recovery Act.

The code may be modified on the basis of experience or changes in circumstances. Such modifications shall be based upon application to the Administrator, on such notice and hearing as he shall specify, and shall become effective on approval by the President.

## New Aluminous Cement Process

BRITISH patent No. 385.032 has been granted to N. V. S. Knibbs, to cover a new process for the manufacture of aluminous cement.

In this process, raw materials containing calcium aluminate are subjected to the action of $CO_2$ for the purpose of carbonating the free lime and the loosely-combined lime. The resulting cement resembles ordinary aluminous cement in its hardening properties, but is more plastic.

The treatment with $CO_2$ is accomplished by passing the raw material through an inclined rotating cylinder through which is passed a counter-current of furnace gases at temperatures ranging from 500 to 700 deg. C.

The raw material itself is obtained by treating highly aluminous material with lime—as, for example, treating alumina and lime in steam for 3 hrs., under a pressure of 200 lb. Suitable raw material may also be produced by treating the lime and aluminous materials with steam and then heating to 1,000 deg. C.

# Exhibits by Cement Mill Equipment Manufacturers Prominent in Exposition

## Nearly 100,000 Visitors at Exposition of Chemical Industries See Display of 244 Exhibitors—Spirit of Optimism Pervades Gathering—Big Volume of Business Transacted

By J. C. WITT

THE men responsible for the Fourteenth Exposition of Chemical Industries (held at New York, December 4 to 9, 1933) could not predict with assurance how it would compare with the previous Expositions. Promoters, exhibitors and visitors alike were pleased with the result. There were exhibits by 244 companies and organizations. Persons admitted by actual registration numbered 33,000—an increase of 50 per cent over the 1931 Exposition.

### Huge Attendance and Much Business

Best of all, there was a spirit of optimism. According to an official report, "Courage and the success that rewards it, were in the air. New plants were being built. More men would be employed. New purchasing agents came to invite bids for plants now about to be constructed. New plants are being designed in the fields of fermentation, distillation, and rectification. One equipment exhibitor reported six times as many sales as at former shows."

On the last day of the exposition, a New York newspaper estimated that the total attendance would exceed 100,000. Certainly this figure seemed conservative enough to the visitor elbowing his way through the crowds to vantage points for inspecting scores of exhibits on two entire floors of the Grand Central Palace. Even at a distance, however, many of the exhibits were interesting. These expositions have become more and more pleasing to the eye. Brilliantly colored, synthetic resins and fabrics; objects of stainless steel, tantalum, and other bright metals; and various lighting effects provided an abundance of decorative features.

### An Exposition of Industries

The first week in December marked two important national events—the Exposition and Repeal. Whether or not the two were in any way related, there were fifty exhibits featuring brewhouse and distillery equipment, showing barrels, tanks, stills, bottle fillers, and labeling and capping machines.

With all the current complaints about the high cost of beverages, one of the most expensive liquids on display was *water*—priced at twelve dollars per quart. A molecule of this liquid contains two atoms of hydrogen and one atom of oxygen, in common with the water that has become so unpopular as a drink. The distinction is that this water contains more than the normal proportion of the so-called *heavy water*—in which hydrogen and oxygen isotopes of higher atomic weights are present. Sales of this type of water, for research purposes, have been active.

The name of the Exposition is appropriate enough, but one who has not attended the previous members of the series might read the title as the Exposition of CHEMICAL Industries, visualizing long rows of reagent bottles, flasks, and beakers. The Exposition of Chemical INDUSTRIES more nearly suggests the nature of the exhibits. The Exposition was largely mechanical in appearance. It illustrated once again the well-known fact that as soon as a chemical process is carried beyond the test tube stage, it requires mechanical equipment and enters the field of process engineering.

### Cement Industry Well Represented

The Exposition guide book contained a list of exhibitors, *classified by products.* It is of interest that nearly one-half the items mentioned may be found in cement plants (exclusive of the laboratories) or are produced by manufacturers regularly supplying equipment to cement plants. Quoting from the report previously mentioned, "Plant machinery and equipment accessories constituted an important division of the Exposition. Forty-five exhibitors were in this section. Unit processes of chemical engineering—crushing and grinding, materials handling, filtration, evaporation, drying, distillation, mechanical separation, pyrometry, and the flow of fluids, were each represented by new developments, also by standard equipment much improved to meet current problems."

Most of these unit processes are carried on in all cement plants, and all of them (with possibly one exception) at many cement plants.

The American Chemical Society had a very interesting exhibit, featuring the development of new materials for specific uses. Unfortunately, it was difficult to study this exhibit in detail, because of the ever-present crowd. The term *designing* is commonly applied to structures and machines. It may be applied quite as appropriately to materials. There are only a few natural materials of construction—such as wood, stone, and clay. Nearly all materials are synthetic, and their manufacture involves chemical processes. The theme of the American Chemical Society exhibit—*Chemistry Catalyzes Commerce*—applied forcefully to the Exposition as a whole.

## Record of Blasts

BLASTING operations conducted by the Valley Forge Cement Company in West Conshohocken, Pennsylvania, are not a nuisance to the neighborhood residents, Judge Corson decided recently and costs were divided between plaintiffs and defendants in the case.

Records of two seismometers placed in the Percy B. Varian home showed greater vibration as a result of a man walking through the hall than it did during a blast. A blast vibration lasted less than one-twelfth of a second.

# ✦ EDITORIAL ✦

## *No Obstacle in Way of Modernization*

THE code of fair competition for the cement manufacturing industry, signed on November 27, places no obstacles in the way of rehabilitation or modernization of existing cement plants.

Neither does the code offer any encouragement to the manufacturer who might be inclined to continue operations indefinitely with obsolete equipment, in the mistaken belief that, under the protection of the code, prices will be held at a level that will enable him to make a profit in any event.

On the first point—that of modernization—the code is specific. In Article VII, which provides means for preventing the construction of new plants or the enlargement of existing plants in districts already suffering from over-capacity, appears this very definite statement: "The provisions hereof shall not be construed to prevent the modernization of existing plants to improve quality of product and/or operating efficiency."

On the second point—that of continuing operations with obsolete equipment—manufacturers who are entertaining such plans should devote careful study to Articles VII and VIII of the code.

Article VIII, for instance, provides in effect that manufacturing costs will be determined from "the one-third portion of the industry which reported the lowest average per unit cost of production."

Previously, in Article VII, appears this interesting provision: "The Board may study the problem of permanent excess of productive capacity in any area, and may from time to time prepare and submit to the administrator for consideration plans for the closing down or amortization of the less economical plants."

The surest way for a plant to arrive at the point where, under the code, it may be scrapped as one of the "less economical plants," is for the management to continue operations with obsolete equipment.

## *Will Cement and Concrete Exhibit in 1934?*

THE Century of Progress Exposition at Chicago is to be repeated in 1934. Information now at hand indicates that the magnificence of the new display will be far in excess of that of 1933.

Many companies and organizations are planning to extend the scope of their exhibits. Others will not repeat. They will drop out of the picture; but many companies and industrial groups who were not in the exposition in 1933 will be on hand in 1934.

Here lie urgent invitations to the cement and concrete construction industries. Several things are needed—most of all, a fireproof all-concrete home of ultra-modern design. Those who saw the continuous stream of people literally pouring through the eight or ten modern homes at the exposition last summer can entertain no doubt of the long-range educational and promotional value of those buildings. Leaders of the products industry might follow the example set by the products manufacturers of Omaha, who a few months ago built the famous "House of Tomorrow" as an educational and promotional venture.

Another feature needed is a small plant manufacturing high-grade concrete pipe, a product that will be much in evidence on public works construction projects during the coming few years. Still another production unit might make light-weight concrete building units, or cast stone, or any one of a number of interesting concrete products. All these products could be displayed in an ornamental garden, together with lily pools, stepping stones, rock outcrops, and the like, all made of concrete.

Then, in addition, what could be more interesting than a miniature cement manufacturing plant, built to a scale perhaps one-eighth of full size, showing every step in the manufacture of portland cement? Public interest in industrial operations and processes was amply demonstrated during the 1933 exposition.

All facilities are available for the operation of a miniature cement plant, and permission may be obtained for the sale of the product itself, as explained in an article on pages 83 and 84 of the June (1931) issue of the Cement Mill Edition of "Concrete."

A miniature cement plant would take intelligent visitors through every stage of the manufacturing process. These visitors would grasp and carry home with them the knowledge that the manufacture of cement is a complicated process. Much would thus be accomplished toward offsetting the effect of the nation-wide attacks of misinformed or unscrupulous politicians, from which the industry has suffered for several years.

The entire industry, representing both manufacturers and users of cement, would gain prestige and public good will from a Century of Progress exhibit; but nothing will be accomplished if every one expects the great promotional organization of the cement industry to do the exhibiting for them. That association has an urgent and heavy program of its own to follow through.

Exhibits belong more properly to individual manufacturers and to groups representing the various branches of the concrete construction industry. From these sources the initiative should come.

# American Institute of Chemical Engineers Covers Wide Range of Technology

## 26th Annual Meeting Discusses Problems Interesting to Cement Manufacturers and Users — More Knowledge Needed on Chemical Reactions in Combustion of Coal

By J. C. WITT

THE 26th annual meeting of the American Institute of Chemical Engineers, held at Roanoke, Virginia, December 12 to 14, 1933, was particularly pleasing and interesting. Technical papers, discussions, inspection trips, and social features all contributed to the value and enjoyment of the event. The retiring president announced that the Institute has shown a gratifying increase in membership during the last few years, when most other professional societies have decreased. This is attributed to a growing understanding of the aims of the Society, and the field of chemical engineering—one of the youngest branches of the engineering profession.

### Of Interest to Cement Manufacturers

The papers and discussions covered a wide range of technology, and there were many points of interest to the manufacturer and user of cement. In addition to symposia on the Principles of Chemical Engineering, and Refrigeration, there were individual papers on such timely subjects as—

(1) Some Chemical Aspects of Coal Utilization, by H. H. Lowry, Coal Research Laboratory, Carnegie Institute of Technology.

(2) The Development of Air Conditioning in Industrial, Residential and Public Buildings; Its Effect on Human Beings; the Factors Which Enter Into Its Design, by P. L. Davidson.

(3) Amortization, Depreciation, Obsolescence and Replacement, by Wyman P. Fiske, Assistant Professor of Accounting, Massachusetts Institute of Technology.

### Should Know More About Coal

Coal is such an important material that one can not avoid being interested in any information concerning it—especially if he is associated with one of the large coal-consuming industries, such as the cement industry. According to Mr. Lowry: "The very considerable increase in the efficiency of utilization of coal by industry within the past two decades may be attributed primarily to advance in methods of handling materials and controlling operations, to the improvement of auxiliary equipment—such as the steam turbine in power generation—and to the development of materials capable of withstanding higher temperatures and pressures. To get the most *from* coal, as well as the most *for* coal, the coal technologist and the coal producer must have a more thorough understanding of the chemical reactions involved in combustion, coking, gasification, and hydrogenation processes and as complete a knowledge as possible of the chemical nature of the coal used. Much fundamental scientific study needs to be given to each of these complex chemical processes."

Mr. Davidson traced the development of air conditioning, starting with the homes of our ancestors between the Tigris and Euphrates Rivers. He mentioned so many industries that find air conditioning necessary, or at least highly desirable, that one is inclined to wonder how much longer the cement industry can do without it.

There were inspection trips to the following shops and plants in Roanoke and vicinity:

Norfolk and Western shops;
Norfolk and Western water plant;
Salem water plant;
Virginia Bridge and Iron Company;
Southern Varnish Company.

Any description of the Norfolk and Western shops would run into large figures—with their buildings hundreds of feet long, massive traveling cranes, and powerful steam hammers. The force of 2,400 men is busy with the maintenance of equipment, and the manufacture of locomotives and freight cars.

### Polytechnic Institute

One of the most pleasant features of the meeting was a visit to the Virginia Polytechnic Institute, at Blacksburg. As guests of the engineering and chemistry faculties, members of the Society were conducted through a series of modern buildings on a beautiful campus, housing well equipped lecture rooms, laboratories, and shops. The power plant, which supplies light and power to the town of Blacksburg as well as the college, is operated by graduate mechanical engineering students. The dwelling of these student-operators is known locally as the B.T.U. House. The tour of inspection terminated at the University Club, where an excellent dinner afforded one more evidence of hospitality.

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## Lehigh Pays Dividend

THE Lehigh Portland Cement Company has declared a dividend of 87½ cents a share on its 7 per cent preferred stock payable on account of accumulations, which will amount to $4.37½ a share, taking effect with this distribution. Payment is due January 2.

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## New Freight Rates Ordered

A NEW sliding scale of freight rates, which will benefit the Portland (Colo.) plant of the Ideal Cement Company, has been ordered submitted by the railroads to the Interstate Commerce Commission.

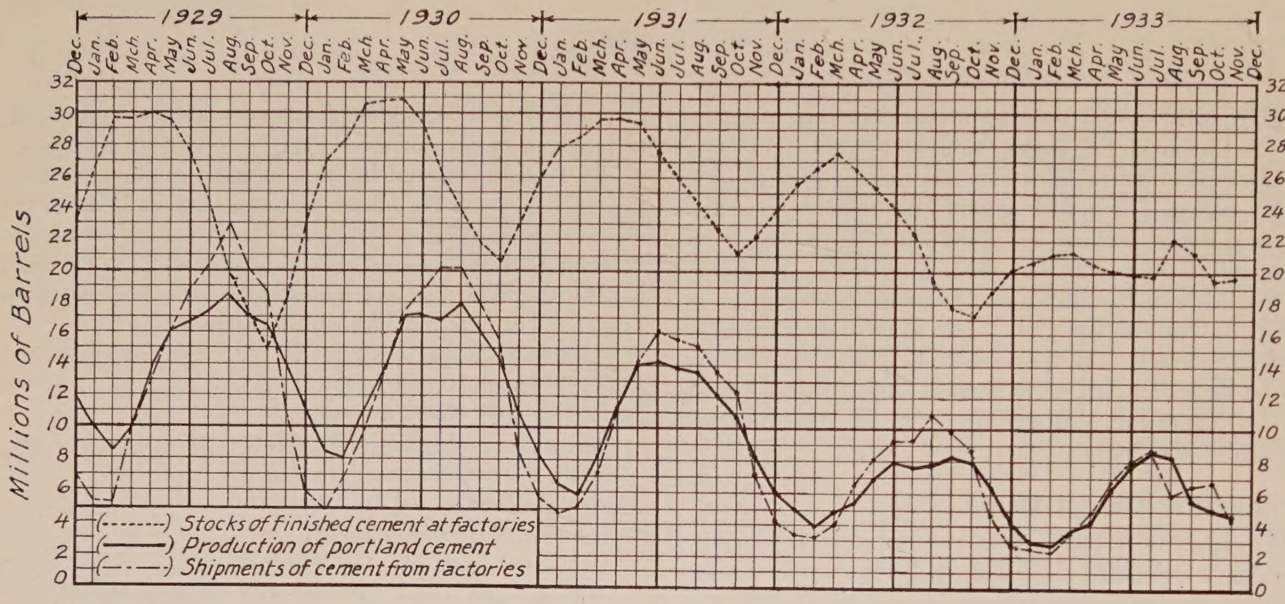
# *Cement Statistics for November*

### *Relation of Production to Capacity (Per Cent)*

| | The Month | Twelve Months |
|---|---|---|
| November, 1933 | 21.2 | 23.9 |
| November, 1932 | 29.1 | 29.0 |
| October, 1933 | 22.1 | 24.5 |
| September, 1933 | 25.5 | 25.5 |
| August, 1933 | 35.9 | 26.5 |

### *Production, Shipments and Stocks of Finished Portland Cement (Barrels)*

| | 1932 | 1933 |
|---|---|---|
| Production, November | 6,462,000 | 4,672,000 |
| Shipments, November | 4,782,000 | 4,463,000 |
| Stocks at end of month | 18,788,000 | 19,711,000 |
| Production for year to date | 72,261,000 | 59,847,000 |
| Shipments for year to date | 77,744,000 | 60,348,000 |



## Michigan's Anti-Cement Plant Hangs On

THE editor of the *Detroit Saturday Night* seems to be none too hopeful that Michigan taxpayers will soon be relieved of the burden of carrying the state-owned cement plant at Chelsea, idle for more than two years, and always a source of loss and an object of political contention when it was under operation.

State officials are now trying to dispose of the plant; but the prophetic vision of the editor reports the following dispatch from a Michigan newspaper dated November 25, 1983 (50 years hence):

> The governor and his advisors recently postponed action on a proposal to dispose of the Chelsea cement plant. Only one bid was received, a Hamtramck junk dealer offering $19.19 if the state would bring the old iron to Hamtramck for him, but this was not looked on with favor. Atty.-Gen. Geevem proposed that the plant be renovated and put to work, but the state engineer said that not only was there nothing worth renovating, but that the second growth forest that has surrounded the decaying buildings would have to be cleaned out before any work could be done. Greevem and the governor had some discussion as to whether the state acquired the plant in 1820 or 1920. It is said there is one man still alive in Chelsea who can remember hearing his grandfather tell about the days when the plant was actually making cement.

If the editor's vision was truly inspired, and not a mere hallucination, many future state administrations will lose sleep over the Chelsea abomination.

## Universal Atlas and Hawkeye Plants Reopen

IN late November the Universal Atlas plant at Independence resumed operations after a shut-down of more than a month, re-employing 125 men. The Hawkeye's plant at Des Moines reopened about the same time.

# From the Patent Office

By J. KAPLAN
Patent Attorney, Washington, D. C.

**Manufacture of hydraulic cement:** Gerald O. Case, Sevenoaks, England. U. S. Pat. 1,848,934.—This process consists in mixing ground calcium carbonate with a clinker derived from burning a mixture of calcium carbonate and aluminum silicate, the clinker and the added carbonate being ground to cement fineness.

●

**Manufacture of cement of high initial strength:** Karl Balthasar, Klagenfurt, Austria. U. S. Pat. 1,844,940.—This is a process for the manufacture of portland cement having high initial strength, from raw materials containing magnesia, such as blast-furnace slag.

●

**Manufacture of cement:** Walter M. Keenan, New York, N. Y. U. S. Pat. 1,932,467, Oct. 31, 1933.—The apparatus comprises a rotary kiln, a nozzle burner projecting a flame into the kiln, and a water wall within the lower end of the kiln. The water is in longitudinal tubes lining the shell, provision being made for circulating water through the tubes.

●

**Method of producing hydraulic cement:** Elias R. Wilner, New York, N. Y. U. S. Pat. (reissue) 19,005, Nov. 21, 1933.—The method comprises the separate heating of limestone to produce quicklime, and the heating of clay, shale or other siliceous earths to a temperature sufficient to activate the material, grinding the mixture to a suitable fineness, and introducing a jet of water or steam into the mixture under agitation.

●

**Cooling clinker and extracting moisture from slurry:** Lester B. Palmer, Osborn, Ohio. U. S. Pat. 1,937,094, Nov. 28, 1933.—This apparatus is designed for simultaneously cooling cement clinker and extracting moisture from slurry. It comprises a revolving cylinder through which the hot clinker is fed, and fins projecting from the periphery of the cylinder, and receptacles for the slurry through which the fins are passed.

# Determination of Lime in Cement for Control of Hydraulic Modulus

LIME is found in cement in three forms, as follows:

(1) Combined with the radical acids $SiO_2$, $TiO_2$, $Al_2O_3$, $Fe_2O_3$, $Mn_2O_3$, $SO_3$.

(2) Dissolved in bicalcium silicate.

(3) Free lime, in the form of quicklime or of hydrated lime.

By dissolving in hydrochloric acid, followed by treatment with oxalate of ammonia, it is possible to determine the total quantity of lime contained in a cement, but one has no idea of its hydraulic modulus.

The determination of the quantity of free lime in a cement can be accomplished by White's method, which consists of treatment by phenol in order to form phenolate of crystallized calcium.

It is also possible to dissolve the free lime in anhydrous glycerine and in pure alcohol, and make a volumetric determination.

The hydrated lime can be determined by a calorimetric method. Two samples of cement are treated by heat. The one heated to 350 deg. C. precipitates the silicates; the other, heated to 550 deg. C., precipitates the hydrate of lime. The difference in loss of weight in the two samples gives the portion of the solution corresponding to the hydrated lime.

The control of the hydraulic modulus of a cement is, therefore, comparatively easy by these simple methods.—Translated from *Le Ciment*, January, 1933.

## How to Sell Russia

THE following "helpful hints" on selling American products to Russia—and such products might include cement—have been issued by J. Anthony Marcus, Russian authority of the AAA at Washington, according to a recent issue of *Business Week:*

"Beware of the man with the 'inside track.' There is none.

"No high pressure salesmanship, no graft payments, no big entertainment allowance. High pressure does not go. The Soviet allows no graft, and there isn't any, for it costs a man more than his job. There is no entertainment cost because Russian officials will not accept it. They entertain you, but you can not repay in kind. There might be suspicion attached to acceptance.

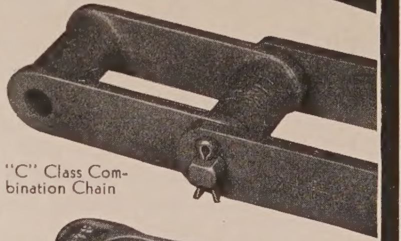
"Three things will sell goods in Russia: merit, price, credit terms.

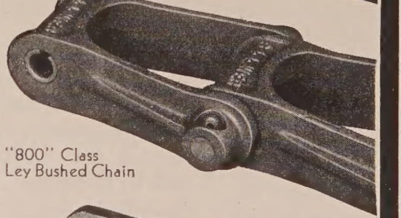
"Salesmanship will consist in getting the Soviet officials to specify your product. It will be worth while to send salesmen for this purpose. Consult the officials at the Amtorg Trading Corporation, New York City, before sending your man to Russia. They may advise that he take your product to Russia for demonstration. Elaborate showrooms are unnecessary. The Soviets will usually provide a place to show your wares. Or, they may advise that you offer your goods for inspection in this country. Certainly the final orders will be placed through the Soviet trade representatives in the United States."

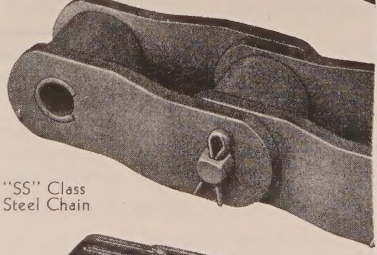
LINK-BELT

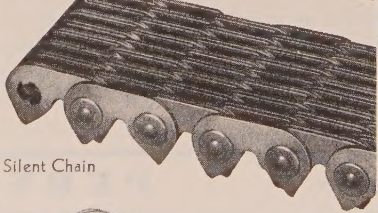
Chains of

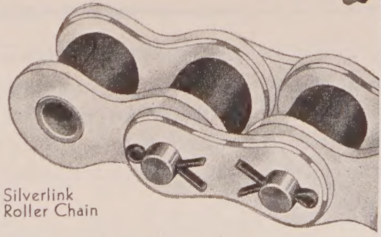
Ewart Detachable Link-Belt


"C" Class Combination Chain


"800" Class Ley Bushed Chain


"SS" Class Steel Chain


Silent Chain


Silverlink Roller Chain

Steel

A complete line of Steel Chains for every transmission and conveying requirement.

Promal

A stronger, longer-wearing metal for cast chains. Ordinarily lasts twice as long as malleable iron, and costs but a fraction more.

Malleable Iron

Link-Belt Malleable Iron Chains have been the standard since 1875 when the first detachable link chain, invented by William D. Ewart, was put on the market by this Company.

for Conveying and Power Transmission

The Correct Chain for Every Service

Send for Catalogs

4882

LINK-BELT COMPANY

Leading Manufacturers of Equipment
for Handling Materials Mechanically and Transmitting Power Positively
Indianapolis, Ewart Plant, 220 S. Belmont Ave., Dodge Plant, 519 N. Holmes Ave.
Chicago Plant, 300 W. Pershing Rd., Caldwell-Moore Plant, 2410 W. 18th St.
Philadelphia Plant, 2045 W. Hunting Park Ave. San Francisco Plant, 400 Paul Ave.
Offices in All Principal Cities
In Canada: Link-Belt Limited—Toronto Plant; Montreal; Vancouver

# MILL EQUIPMENT

## New Tramrail Sliding Switch

The Osborn Manufacturing Company, Cleveland, Ohio, announces a new tramrail sliding switch.

The design is said to be revolutionary by endeavoring to take into consideration that an installed tramrail switch involves the switch itself, the supporting superstructure, the fittings, the curved and straight rail entering the switch, and the combined erection time of these elements.

J. B. Forker, Jr., is sales manager, Osborn Tramrail Systems.

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## New Gall-Proof High-Temperature Thread Dope

Armite Laboratories, Los Angeles, Calif., have put on the market a new metallic lead thread lubricant, claimed to be of great value in the assembling of machinery and in the repair of equipment that is subjected to high temperatures and general abuse. Even a bright red heat does not harden or destroy the compound in the threads, they say.

The makers describe the product as being a very finely divided metallic lead in paste form, and claim that in use a film of metallic lead is formed between the threads that prevents galling, speeds up repair work, and cuts costs

## Field Activities

### *Allis-Chalmers Gets Order for Two Clinker Coolers*

*The Allis-Chalmers Manufacturing Company*, of Milwaukee, has received an order for two of that company's new Air-Quenching Clinker Coolers, 3 ft. 6 in. wide and 36 ft. long, to be installed at the earliest possible date in one of the eastern plants of a large cement manufacturing company.

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### *F. W. Young Joins Oliver United Filters*

F. W. Young, formerly with Filtration Engineers, Inc., and more recently with the Pulp Filter Company, has joined the sales organization of Oliver United Filters, Inc., New York, Chicago, San Francisco and Toronto.

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### *Dust Collector Installations*

*The Northern Blower Company* of Cleveland, Ohio, has just completed an installation of a dust collector at the new packhouse of the Huron Portland Cement Company, Oswego, New York. They also have an order for installation of a complete dust collecting system for the kiln room and clinker handling at the San Antonio Portland Cement Company, San Antonio, Texas.

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*Wayne H. Perry*, attached to the office of J. W. Lewis, assistant to President Gerard Swope of the General Electric Company, has been elected an assistant secretary of the company, with offices in the new G. E. building, 570 Lexington Avenue, New York City.

## Obituary

*Myron F. Westover*, who retired in 1928 after having been secretary of the General Electric Company for 34 years, died at his home in Schenectady, N. Y., on October 21, at the age of 73 years.

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*Herbert H. Dewey*, vice president of the International General Electric Company, Inc., died at his home in Schenectady October 25 after a short illness.

## Industrial Literature

### *Brown Potentiometer Pyrometer*

A folder briefly describing and illustrating the Brown Potentiometer Pyrometer has just been issued by the Brown Instrument Company of Philadelphia, Pa.

With stainless steel parts and wide bearing surfaces, the Brown Potentiometer is said to bring laboratory accuracy to industry.

Copies of Catalog No. 1101 with full description is available.

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### *Hardinge Products Bulletin*

A new Hardinge Products Bulletin has just been published by the *Hardinge Company, Incorporated*, York, Pennsylvania. This 4-page leaflet illustrates and describes briefly their numerous products. Pulverizing and grinding mills; conical ball and pebble mills; reverse current air classifier, designed for operation in conjunction with the conical mill; tube mills; thickeners, clarifiers and sand filters; and the Hardinge constant weight feeder are among those briefly described.

Full details of these products are available in other bulletins.

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### *New Worthington Bulletin*

Worthington Feather Valve Compressors (Horizontal Duplex Motor-Driven—direct connected and belted) is the title of Bulletin L-612-B1A, covering types DB and DC, just issued by the *Worthington Pump and Machinery Corporation*, Harrison, New Jersey.

Copies may be had by writing the company on your business letterhead.

## ✦ PERSONALS ✦

*Holger Struckmann*, president of the International Cement Corporation, died on November 17 in Copenhagen, Denmark. Mr. Struckmann's home was at Greenhaven, Rye, New York. He had visited the corporation's subsidiaries in Argentine, Uruguay and Brazil and was returning to the United States by way of Europe.

*Richard F. Hoyt* has been elected chairman of the board and chairman of the executive committee of International Cement Corporation, succeeding the late F. R. Bissell.

*Charles L. Hogan*, formerly senior vice-president, has been elected president of the corporation, succeeding Holgar Struckmann. Mr. Hogan was also elected a member of the board of directors and of the executive committee.

*Wesley A. Rowell*, who came to New Hampshire thirteen years ago to introduce concrete for road construction and was largely responsible for the building of hundreds of concrete roads in northern New England, died November 12. Mr. Rowell has been sales manager of the Lehigh company in New Hampshire, Maine and Vermont for the past nine years.

*James A. Johnson*, 80, one of Schoharie County's oldest citizens and one whose life story parallels the history of the cement industry at Howe Cave, died on October 31.

*Willoughby Elwood Snyder*, former cement chemist in the Allentown, Pennsylvania, cement plants, died December 14.